



# Sustainable Urban Infrastructure

Vienna Edition – Role Model for Complete Mobility

A research project sponsored by Siemens

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1.0

# Introduction



Why choose Vienna? Just as most other cities globally, Vienna is exposed to unprecedented pressures. Urbanization is a growing phenomenon and, in 2009, for the first time there were more people living in cities than in the countryside. With many cities growing at staggering rates, there is increasing pressure to somehow manage often chaotic urban areas. New markets for passenger, freight and air-related mobility infrastructure are constantly evolving.

Mobility and transport lie at the heart of any successful city in the future. And

Vienna does consistently better than most in these areas. This is why this study concentrates on the Austrian capital to present the findings of intensive research by Siemens and MRC McLean Hazel Ltd., focusing on Complete Mobility.

What is Complete Mobility? To better analyze the status quo, we have defined a clear vision of a mobility system fit for the future, called the concept of Complete Mobility (CM). In 2008 we created the Complete Mobility Index (CMI), enabling us to assess the progress towards CM in 46 cities around the world. Their efforts were scored against 11 indicators. Each city received an averaged score which was then plotted against its per capita GDP, reflecting the positive relationship between CM and economic performance. In the 2008 Index Vienna performed very well, ranking third.

**“Vienna reflects its own musical heritage: ‘Vienna’s mobility orchestra’ ranks among the best in the world.”**



This study now presents an updated and revised CMI for 2009. Some fundamental changes have been made to the indicators used and all data has been updated. We will show the impact of these changes, again concentrating on Vienna which didn't disappoint and ended up ranking within the leading group of cities which are categorized as "best in class".

In this study we wish to shed some light on the reasons why Vienna consistently scores well within the CMI. Hopefully this can be of some inspiration to decision makers in cities everywhere who are looking for best practice solutions to the challenges which they face. Good performance in the Index is usually based on years of hard work and tough decisions based on foresight rather than fixing problems as they arise. Other cities can benefit greatly from studying Vienna's approach to mobility and transport.

We will start by reviewing the trends to which all cities are subject and how they apply to Vienna. We will then move on to an explanation of the Index and an examination of Vienna's scoring compared to other cities. We then go on to look deeper into Vienna's approach to tackling the transport and mobility issues, giving valuable insights to city managers everywhere.

Our study concludes by pointing toward further development opportunities linked to the concept of CM. For cities globally there is no one path to CM. We hope that the sharing of best practice and this report will open up a debate which can assist in the development of transport systems which support local economic development, the quality of life of citizens and the environmental imperatives of cities and therefore the world.

### 2.0

# What is Complete Mobility?



Growing demands on mobility and transport are an inescapable consequence of global trends. Evolving demographic, social and economic trends create ever-changing demands for mobility by individuals, companies and governments. Cities, big and small, see themselves faced above all with the transport challenges since their very survival as a thriving and desirable place to live can depend on a reliable and worthwhile transport system.

Globally growing urbanization adds to the problem – on average, approximately two people become urban dwellers every second. This means for 193,107 people move into cities every day, an awesome number<sup>1</sup>. However, we need to keep in mind that these figures hide a great deal of geographical variation; most rapid urbanization is happening in the developing world, whereas in Europe a third of cities noticeably declined in size between 1996 and 2001<sup>2+3</sup>.

Still, a recent Siemens-sponsored study of megacities showed that cities around the world are facing similar challenges in health, mobility, social development, security, water and energy resource management. In our interviews with city stakeholders they clearly perceived the issue of mobility and transport to be the key challenge facing cities now and in future.

Paying heed to the need for holistic and effective mobility strategies, we created the concept of Complete Mobility (CM). For a definition of CM, see box on the right.

In this study, we use the city of Vienna to illustrate the concept of CM. Vienna epitomizes a city where the fundamental values of CM have been applied – with impressive results.

On weekdays, total journeys made by public transport (35 %) trump those made by private transport (32 %). In Austria, Vienna also boasts the lowest proportion of cars

- 1 UN Habitat, State of the World's Cities 2008/2009 – Harmonious Cities
- 2 UN Habitat, State of the World's Cities 2008/2009 – Harmonious Cities
- 3 Figure refers to the annual total population growth rate.
- 4 UITP, Vienna: A City for All 2009
- 5 <http://www.mercer.com/qualityofliving>
- 6 Liveability Ranking, 2007 [http://www.economist.com/markets/rankings/displaystory.cfm?story\\_id=11116839](http://www.economist.com/markets/rankings/displaystory.cfm?story_id=11116839)



## Definition of Complete Mobility:

A concept aimed at identifying a pathway for a city to develop the most efficient, sustainable and user centered passenger and freight mobility system.

CM represents a paradigm shift. It describes a mobility system which is actively managed to balance individual lifestyle choices with environmental quality, global competitiveness and the quality of life ambitions in an urban area.

per 1000 inhabitants and the best energy balance in relation to fuel consumption and CO<sub>2</sub> emissions in traffic<sup>4</sup>.

For many years now Vienna has been scoring highly in Mercer's Global Quality of Living Cities Index. In 2009, however, it has finally taken top spot, replacing long-time leader Zurich<sup>5</sup>. The Economist Intelligence Unit placed Vienna third in its global livability ranking<sup>6</sup>.

Last but not least, Vienna is a growing city – since 2001 it has grown by approximately 7 % and is thus among the third of European cities which is experiencing continual growth. Students, international migrants and people attracted by the proximity of the newly opened eastern European markets are the main drivers for this growth.

We will look at Vienna through the CM looking glass, examining its transport management history, status-quo and projected future. It will be shown that CM provides the ideal frame of reference to do so in a meaningful manner.





## 2.1

### Megacities – Challenged Giants

In 2006 we decided it was time to find out more about an entity which looks to be a growing factor in human life: The megacity. Siemens sponsored a study entitled: “Megacity Challenge – a Stakeholder Perspective” which collected data and opinions at the individual megacity level. We gathered objective data as well as perspectives from mayors, city administrators and other experts on local infrastructure challenges.

The study yielded a number of interesting insights into how challenges are prioritized and which infrastructure solutions have the most positive impact on local economies, the environment and the quality of life

- Economic competitiveness and employment are the first priorities
- The environment matters, but may be sacrificed for growth
- Transport overtakes all other infrastructure concerns
- Better governance is a vital step towards better cities
- Holistic solutions are desired but difficult to achieve
- Cities will seek to improve services, but could do more to manage demand
- Technology will help to deliver transparency and efficiency
- The private sector has a role to play in increasing efficiency.

Three of these findings are particularly pertinent to mobility. These formed the basis for further research into future mobility systems as encapsulated by CM.

These are:

#### **Transport overtakes all other infrastructure concerns**

Out of the five infrastructure sectors covered – water, electricity, transportation, healthcare and safety and security – transportation clearly emerged as the top challenge for megacities. It is the one infrastructure area which stakeholders believe to have the biggest impact on city competitiveness. Its green aspects are also high





on everybody's mind, making city administrators eager to move on to greener mass transit. Unsurprisingly, transport emerges as the top priority for investment, leaving other areas behind regardless of their undisputed impact on the overall attractiveness of a city.

#### **Better governance is a vital step towards better cities**

With so many infrastructure areas crying out for a piece of the investment budget constraints are of course a big issue. However, the study showed that more than half of those involved in city management see improved governance as the key to better performance, as opposed to only 12 % who felt that increased funding is the solution to the problem. Apart from strategic planning, the focus is on managing infrastructure and services more efficiently. Both these goals require cities to move beyond the passive administration of existing services and embrace a more active style: managing systems by focusing on improving efficiency and making outcomes more measurable.

#### **Cities will seek to improve services, but could do more to manage demand**

Faced by huge pressures on public services, cities tend to favor direct and immediate supply side solutions. While not al-

ways advocating the building of new infrastructure per se, most respondents feel there's a need to increase the efficiency of existing infrastructure. However, only very few respondents see demand management as a solution to the problems at hand, and none makes it a priority. Even specialists in specific infrastructure sectors don't see it as a primary solution. Yet: Consumption consistently outstrips supply in many cities. Thus there is a strong case to be made for the wider adoption of demand management strategies on a global basis. Here, the proper pricing of services could be a step forward.

#### **Technology will help to deliver transparency and efficiency**

The ability to create efficiency and provide more accountability to citizens are the two major benefits of technology. This is clear to most city managers: Eight in ten respondents thought that advanced IT solutions will increasingly be integrated into their administration and operations over the next five years. Moreover, the emphasis is shifting from more staff to digitalization or e-government. (64 % to 34 %). Interestingly, the value of technology is not only recognized in mature cities but equally in emerging cities of the developing world.



## 2.2.

### Complete Mobility Trends

Our previous Complete Mobility study unveiled twelve significant trends shaping the future of mobility. These are:

As a primary economic trend, increased per capita income as predicted by the World Bank took first place. These rise in income is not confined to the rich: income is also increasing among the middle and poorer classes. Between 2006 and 2030 per capita income in developing countries is expected to rise by 3.1 % on average<sup>7</sup>. Vienna mirrors this trend with disposable income rising from an average of €15,800 to €19,400 between 1995 and 2006<sup>8</sup>. However, tightening financial conditions around the world undercut disposable income in Vienna as much as in the developing world.

Since 1980, world trade has grown five-fold in real terms, so globalization is another trend which we investigated as a clear force. Vienna, in particular benefits from Austria's membership in the EU and its vicinity to the eastern states of Europe which have recently joined the EU. EU trade growth has been ensured by a coupling of economic integration and relaxing of regulations as well as improvements to infrastructure. With the EU's eastwards expansion, Austria has become an attractive hub for regional trade. In 2007, the value goods exported from Austria rose from US\$ 133.8 billion to US\$162.1 billion <sup>7</sup>.

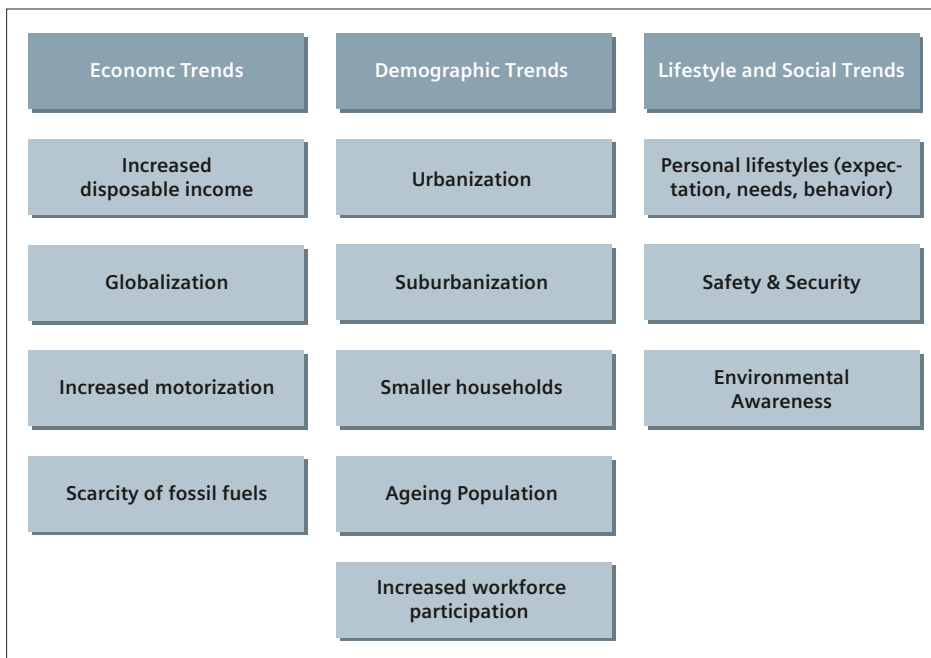


Figure 1

Global Trends



We took the traffic along the Austrian Danube corridor as a good indicator of the volume of trade between eastern and western Europe; here between 1994 and 2007 cross-border freight traffic volume increased by 157 % from 31.4 metric tons to 80.7 metric tons. The absolute volume of road traffic increased by a staggering 590 %<sup>10</sup>. Between 2006 and 2007 alone, truck traffic volume rose by 20 %<sup>11</sup>. Regardless of the current slowdown caused by the global financial crisis, long term predictions for the region remain positive.

Another important trend – or maybe the result of other trends – is increased motorization worldwide, fueled not least by the development of cheap mass cars such as the Tata Nano. This trend continues despite the scarcity of fossil fuels and the recent hike in oil prices. However, in 2008 the soaring price of crude oil did noticeably impact not only car sales but also decisions about where people wanted to live. Moving to the suburbs suddenly didn't seem such a good idea unless it was in reach of public transport.

As a city, Vienna has to some extent resisted the general trend of rising car ownership. Between 2004 and 2008 the number of passenger cars in Austria rose from 4,109,000 to 4,285,000.<sup>12</sup> During the same period, Vienna experienced a drop in motorization – in 2001 there were 414 cars per 1000 inhabitants<sup>13</sup> compared to 395.1 in 2007<sup>14</sup> (in Austria the 2007 figure stood at 511.6 per 1000). Not only are the Viennese driving fewer cars, they are also using public transport more than before. In 1993, 29 % of public transport users stood against 40 % car users while by 2007 these figures had changed to 35 % public transport users versus 32 % car users<sup>15</sup>.

Clearly urbanization and suburbanization continue to have considerable implications for the provision of transport. While worldwide the number of people living in urban areas has for the first time surpassed the 50 % mark, it is expected to rise to 60 % fairly quickly. In fact, the EU, where urbanization is an old phenomenon, has already surpassed this marker.

7 World Bank, Global Economic Prospects 2007

8 Statistik Austria: Regional Accounts

9 Economist, Austria Factsheet [www.economist.com/countries/Austria/profile.cfm?folder=Profile-FactSheet](http://www.economist.com/countries/Austria/profile.cfm?folder=Profile-FactSheet)

10 [http://www.donauschiffahrt.info/daten\\_fakten/statistiken/transportaufkommen](http://www.donauschiffahrt.info/daten_fakten/statistiken/transportaufkommen)

11 ÖIR based on ASFINAG, constant data collection of traffic

12 [http://www.statistik.at/web\\_en/statistics/transport/road/stock\\_of\\_motor\\_vehicles\\_and\\_trailers/028447.html](http://www.statistik.at/web_en/statistics/transport/road/stock_of_motor_vehicles_and_trailers/028447.html)

13 UITP, Mobility in Cities Database 2005

14 <http://www.wien.gv.at/english/politics/statistics/pdf/verkehr-e.pdf>

15 City of Vienna, Smart Moves 2009



“Vienna sees itself as a  
model environmental city”

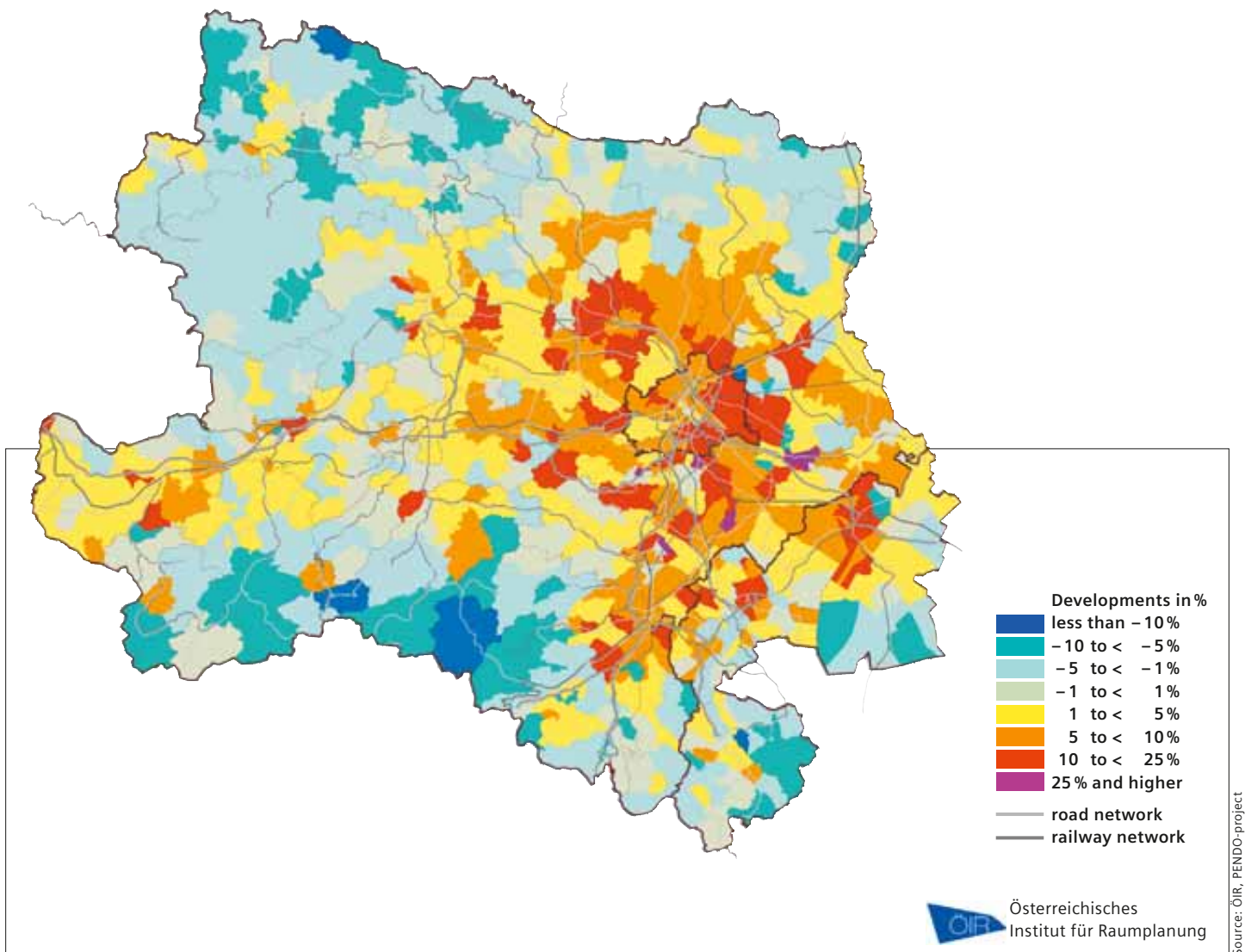


Figure 2

Austria Regional Population Development 2001-2008



Despite this, cities themselves are becoming less densely populated due to suburbanization and the expansion of built-up land area. Over the last decade, the density of cities in more developed countries with a minimum of 100,000 inhabitants decreased by 2.2 % on average.<sup>16</sup> Figure 2 shows how this trend has impacted Vienna. An area of development surrounding the historical center and along the main transport axes is clearly visible.

Although Vienna does experience development on its fringes and “in-between” other cities (such as the new Aspern district towards the north), urban sprawl is much less evident than elsewhere: There has been less than 50% increase in developed areas between 1950 and 1990.

A trend particularly strong in Western Europe is the falling average household size and a rise in single-person households: The number here is 28.9% compared to just 3.1 % in Africa and the Middle East. Austria is a case in point; single households have risen from 893,500 in 1991 to 1,240,000 in 2007 and average household size dropped from 2.54 to 2.32 persons.<sup>17</sup>

Ageing population is a trend that, unlike differing sizes of households, affects all countries. The UN predicts that by 2050 22% of the world’s population will be aged 60 and over. In 1998, 15.4 % of Austria’s population were aged 65 or over (1,224,215

people); by 2008 this number had risen to 17.1 % (1,427,625 people).<sup>18</sup> Traditionally, Vienna has tended to have more elderly population, although recently there has been some rejuvenation due to more young and middle-aged citizens moving there.<sup>19</sup> Currently, 22 % of Vienna’s population is over 60 years of age.

As a trend, increased workforce participation is evident in differing forms across the globe. For example, part time work has increased significantly in industrialized regions and more flexible working patterns are being encouraged. Women’s employment continues to rise across most regions as do women’s educational levels. Between 1992 and 2005, women’s employment in Austria rose from 58.9 % to 62 % and employment of those between 55 and 64 years of age has also increased<sup>20</sup>.

While individual lifestyle choices may vary hugely, a shift towards personalized lifestyles and individual freedom is noticeable everywhere. There is also a tendency towards both simplicity and luxury and towards connectivity through new technology. Internet and mobile phone usage is rising across all regions, underpinning these trends. Austria and Vienna are no exception: In Austria, 54 % of households had broadband internet in 2008 (up from 15.9 % in 2004). This figure is slightly higher in Vienna. Other indicators are the fact that 90.4 % of Austrians had a mobile phone in 2008 and 37 % of the population shopped online in 2007.

Along with everyone else, the Viennese expect ever-better safety and security levels, be it road safety or protection from terrorist attacks. And, last but not least, the general population is becoming more willing to adapt their behavior to counteract climate change and support sustainability across the world. Vienna is taking positive steps towards reducing its impact on the environment, focusing on areas such as air pollution or wastewater treatment. It sees itself as a model environmental city<sup>21</sup>.

<sup>16</sup> World Bank, The Dynamics of Global Urban Expansion 2005

<sup>17</sup> [http://www.statistik.at/web\\_en/statistics/population/households\\_families\\_living\\_arrangements/032308.html](http://www.statistik.at/web_en/statistics/population/households_families_living_arrangements/032308.html)

<sup>18</sup> [http://www.statistik.at/web\\_en/statistics/population/population\\_stock\\_annual\\_and\\_quarterly\\_data/population\\_structure/028626.html](http://www.statistik.at/web_en/statistics/population/population_stock_annual_and_quarterly_data/population_structure/028626.html)

<sup>19</sup> European Urban Audit, State of European Cities Report 2007

<sup>20</sup> European Commission, Employment in Europe 2006 & Eurostat. (Employment rate of older workers rose from 29.1 % in 1996 to 38.6 % in 2007.)

<sup>21</sup> <http://www.wieninternational.at/en/node/3621>



## 2.3

### Trend in Focus: Migration

A phenomenon common to all megacities is urban sprawl and resulting suburbanization. In Vienna, a significant rate of migration to the city creates a high proportion of foreign residents as well as boosting population size.<sup>22</sup> See Figure 3 for the concentration of foreign nationals in Vienna.

According to Statistik Austria, in 2008 19.8% of the population of Vienna was non-Austrian, reflecting a decades-long trend. In 2007, net migration rose to 12,545; 25.4% higher than just one year earlier.<sup>23</sup>

Vienna welcomes many immigrants from former Yugoslavia (35% of migrants) and Turkey (12%). However, the number of EU immigrants is also on the rise, with Germans taking a leading role at 11.6% p.a.<sup>24</sup> Austria's main attraction is employment and educational opportunities. Vienna's central position within the expanded EU has turned it into a regional commercial hub, further encouraging international companies to set up in the city. In line with the rest of Austria, Vienna has imposed some restrictions on immigration via transient quotas on workers and a ban on self-employed craftsmen.<sup>25</sup> However, these restrictions expire by 2011, making control of immigration much more difficult. An

additional attraction is Vienna's universities: In 2005/06, nearly 20% of students were of foreign nationality.<sup>26</sup>

Migration and city development have of course resulted in increased suburbanization. Vienna has 1.6 million inhabitants; there are 2.5m in the region in which Vienna serves as the main urban center. This creates issues for governance and transport management which will be explored below.

<sup>22</sup> Statistics Austria, Austria: Data, Figures, Facts 2008 explains that in Austria, migration almost exclusively accounts for the rising population – the natural birth and death rates are nearly equal.

<sup>23</sup> Vienna City, Vienna in Figures, 2008

<sup>24</sup> Statistik Austria, Statistik des Bevölkerungsstandes

<sup>25</sup> Reuters, Habsburg reloaded? Immigrants set to swell Vienna April 2007

<sup>26</sup> <http://www.wieninternational.at/en/node/3542>



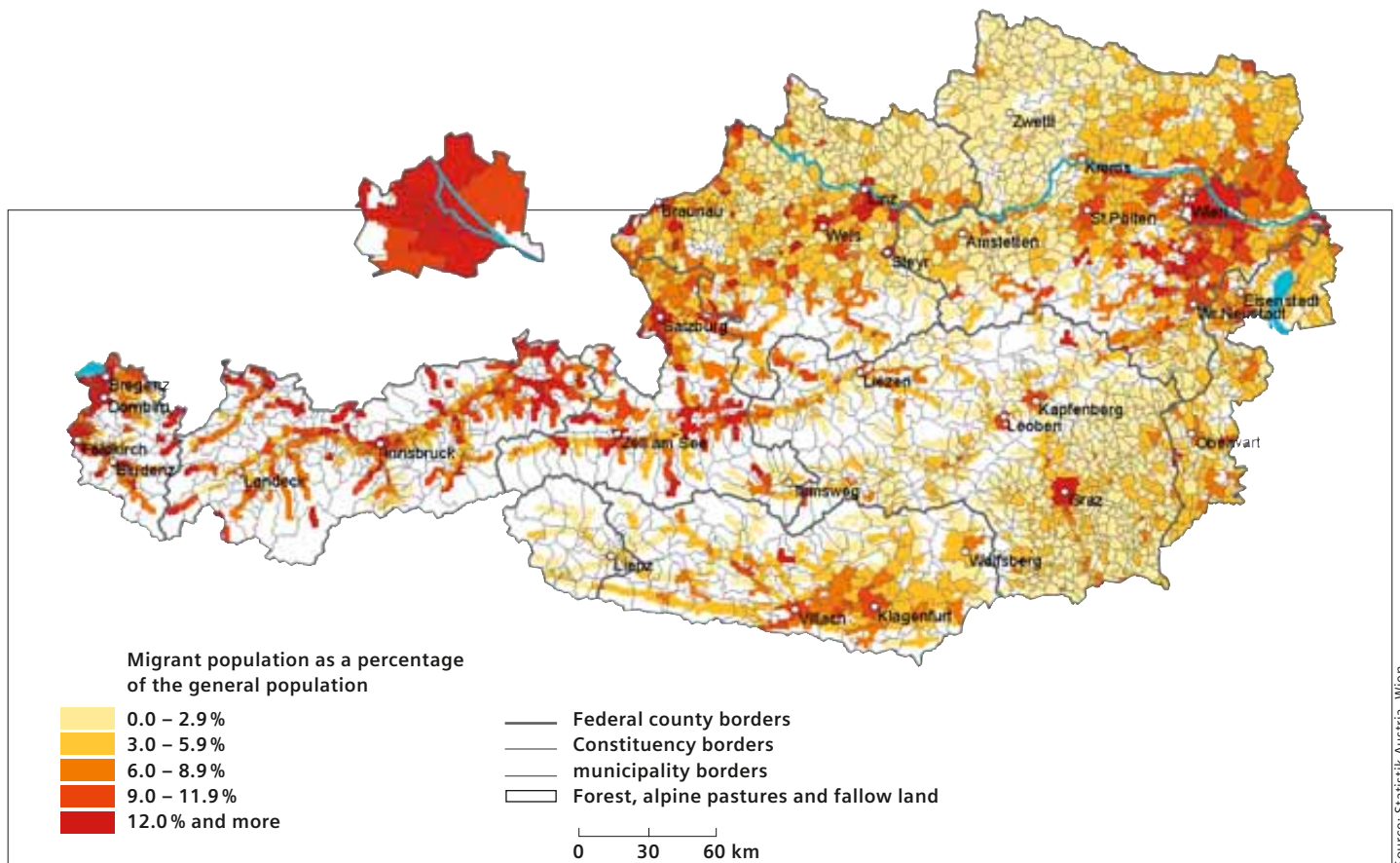


Figure 3

Population on 1.1.2009 with foreign nationality



## 2.4

### From Trend to Concept

Even though the twelve global trends introduced above are not an exhaustive list, they certainly are major forces when it comes to mobility and transport needs. To reflect reality in Vienna we have added the trend of migration. The complex interactions between all these trends – their synergistic relationship – create a whole series of consequences and requirements for future mobility. Take urbanization: On its own, this trend challenges cities to cover the increasing demand for passenger and freight transport within the central urban area. If you combine this with the resulting suburbanization, a different picture emerges. Managers must be pushed towards:

- Increasing transport capacity both within and beyond the urban core
- Increasing the availability of radial movement as passengers travel not only between center and suburb, but also between different suburbs.
- Meeting the need of complex travel patterns and journeys.

Each possible grouping of different trends is likely to produce new concerns. There is no one-size-fits-all approach to mobility.

Figure 4 demonstrates in a simplified manner the movement from trend to mobility need, taking four trends as an example.

This figure shows the way in which we analyzed all trends which ultimately led to our answer for future mobility requirements: The concept of Complete Mobility.

It is a given that people want to make the lifestyle choices they desire with minimal constraint. This is an example of where mobility and transport systems increasingly must be able to support people in the choices they desire.

In order to do this, we suggest that transport marketing must be segmented, possibly by offering different incentives to different groups of people and offering people the choices which correspond with and support their personal lifestyles. CM therefore incorporates at its core two components related to lifestyle choices: Mobility should be user friendly and enhance lifestyle choices. Segmented market offers are one way in which these components might be turned into a real solution.

The same is true for each of the examples offered: A trend (or combination of trends) creates a mobility need; CM provides a vision towards meeting these needs.

Figure 4 must be studied with two caveats: Firstly, these are only a few examples which do not show the interaction be-

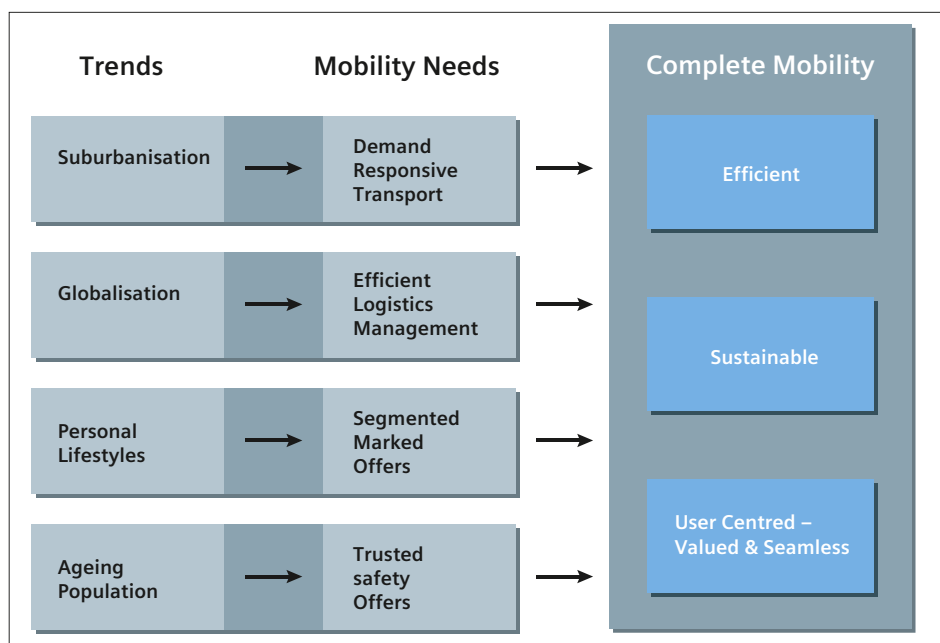


Figure 4

From Trend to Concept

tween trends. Secondly, different trends will often create a similar mobility need. Segmented market offers, for example, can be a solution for lifestyle choices but also for ageing populations which need to

be given relevant offers encouraging their appropriate use of the network.



## 3.0

# Why Vienna?



## 3.1 Mobility Index

In 2008 Siemens presented the Complete Mobility Index (CMI) in “como magazine”, intended to give a comparative insight into the status of global cities with regard to their CM achievements. As explained earlier, we used a composite of 11 qualitative and quantitative indicators including measures for local and external connectivity, externalities and finance using 1995 data from UITP’s Millennium Cities Database. The quantitative indicators were scored by a team of international experts.

To further clarify matters, we developed scoring notes for each indicator which could explain why a city scored as it did on an ascending scale of 1 to 6. A total of 46 global cities were scored against all 11 indicators and an average score was calculated for each city.<sup>27</sup> This final score was then plotted against each city’s per capita GDP figure. The resultant graph is shown in Figure 5.

### Three groupings of cities are highlighted:

1. Struggling to Cope – includes cities with low per capita GDP Transport and mobility provision is fairly basic.
2. At Risk – includes many developed cities with a high dependency on private car use, high energy use and rising mobility costs
3. Best in Class – Cities in this group have scored above average for their level of GDP.

You can see from Figure 5 that Vienna scored well in this original Index, coming in third together with Tokyo. Only Amsterdam and Zurich scored higher than Vienna’s 5.0 points out of a possible 6.0.

Interestingly, Vienna scored consistently high across all indicators, reaching the highest possible score in three (road infrastructure, energy use intensity and transport cost) out of 11. Vienna’s other scores

were all in the 5s and 4s, distinguishing it from other cities that might have scored some 6s, but also have some very low figures. Vienna’s overall scores reflected a sound all-round integrated performance.

Importantly, Vienna has also managed the demands of growth to a good degree. Migration is a common challenge for cities around the world, increasing overall demands on infrastructure, but also changing the shape of a city by adding to urban sprawl and/or increasing density in certain, often cheaper, areas.

<sup>27</sup>The scope of the indicators and their definition is, of course, open to discussion but is based on professional judgement and review.

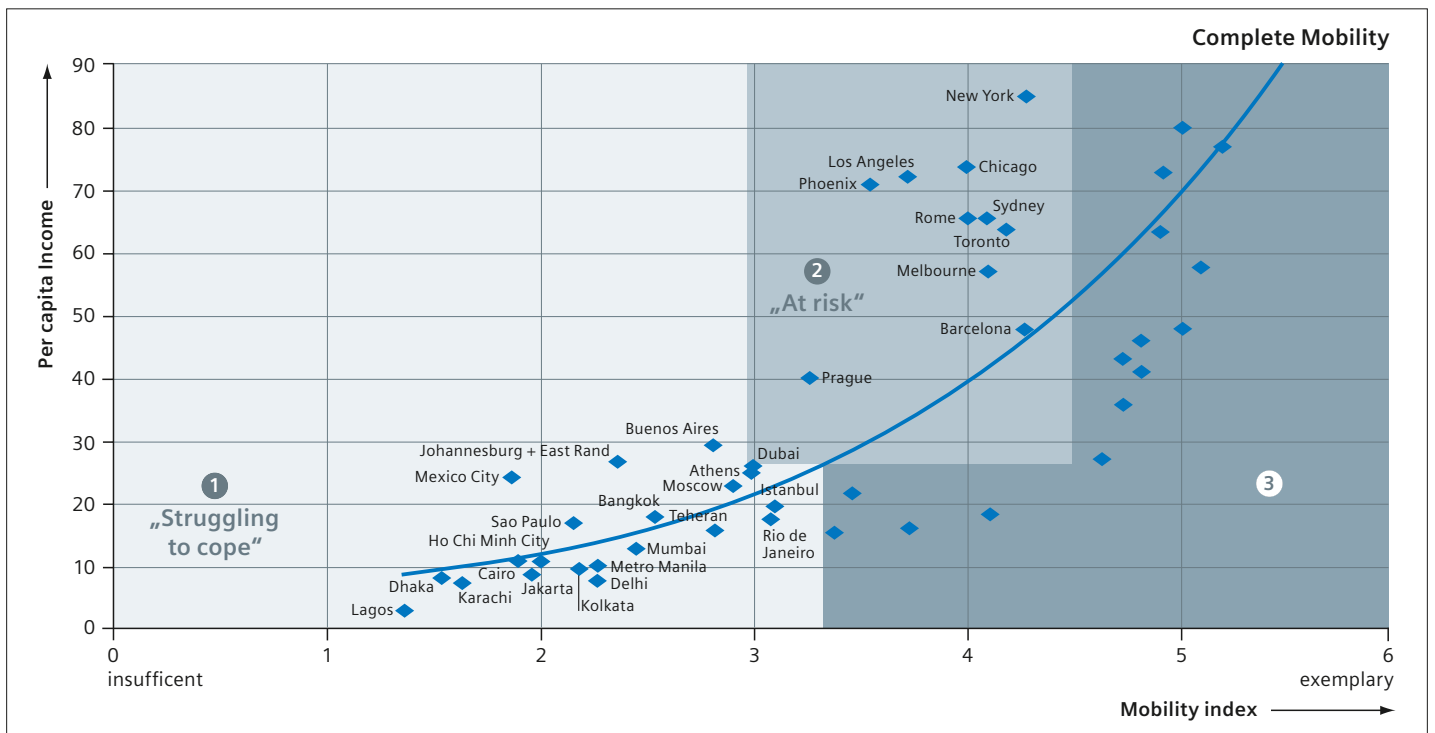


Figure 5

Initial 2008 Mobility Index



## 3.2

### Vienna as Best Practice

Vienna's high score in the 2008 Index and its continued success warrant further observation as decision makers in an increasingly globalized world look for best practice solutions to the challenges which cities face. However, there can be no panacea for success; the cities that scored well have been working hard for years to achieve their current status. A bit of luck also never goes amiss, as, for example, with geographic positioning. And these cities will have made mistakes along the way too.

The Index is necessarily reductionist. It doesn't claim perfection but is designed to prompt new thinking and fresh insights. This study of Vienna is meant to support other cities, because its position in the Index makes it an interesting lesson in best practice in urban mobility.

Best practice comes in many guises: New heavy and light infrastructure, targeted initiatives, or new decision-making approaches, to name but a few. The research undertaken on behalf of Siemens has identified a number of such best practices within the CM framework. In effect, these practices can support cities in moving up the global CMI and should be of great interest to any city interested in a successful future. And not only megacities need take heed: Smaller regional centers are just as likely to benefit from taking a look at best practice examples.

The following explores in more detail CM best practice as exemplified by Vienna.



4.0

# Bringing the Complete Mobility Index Up to Date



The original CMI was based on data from 1995. Clearly, we needed to update the data to present an accurate picture of the situation in 2009. Hence, we used data gathered in 2007/8 and added a new selection of indicators (see Table 1). Finding out whether Vienna would score as highly

in a revised CMI as it did in the old CMI using 1995 data was a fundamental aspect of this study.

Below we examine the revisions made to the CMI, explain the scoring methods used and present the revised Index.

“Vienna’s position in the Index make it an interesting lesson in best practice in urban mobility”

## 4.0 Bringing the Complete Mobility Index Up to Date

### 4.1 Adding New Indicators



#### 4.1

### Adding New Indicators

As the world has changed, so have the indicators which are useful and necessary to establish a meaningful CMI. The new indicators included mirror this change. See Table 1 for a list of all updated indicators, including adaptations and additions.

**Let's examine the new indicators in more detail:**

**Performance of Road Network.** Efficiency of the transport system and efficient mobility are a critical component of CM. Reliability and changes in journey times are two efficiency factors measured – we used changes in journey time over the past five years to measure the efficiency of road networks. To achieve a reliable result, we decided to take a point within a 5 to 10 km range from the city's business center and take the change in the average journey time from that point to the business center as our measurement.

**Reliability of Rail.** Since a rail system's punctuality is a critical factor in encouraging its use we took the percentage of passenger rail services which arrived on time (give or take 5 minutes from the published timetable) to determine the system's effi-

ciency. Passengers' impression of rail services takes a dramatic turn for the worse as soon as they suspect the service to be unreliable.

**Dedicated Cycle Lanes.** The initial Index was heavily weighted towards road traffic. This is no longer seen as an accurate representation of transport today. Therefore, we decided to include other important modes of transport; measuring the dedicated cycle lanes in a city seemed like a good way of covering alternatives to road traffic.

**Affordability.** Not even the best and most finely calibrated integrated transport system in the world will have any positive effect on CM if it stops being affordable for the average user. Therefore we see affordability as another critical component for a modern CMI and we measured it by calculating the average cost of public transport travel (per km) as a percentage of average household income.

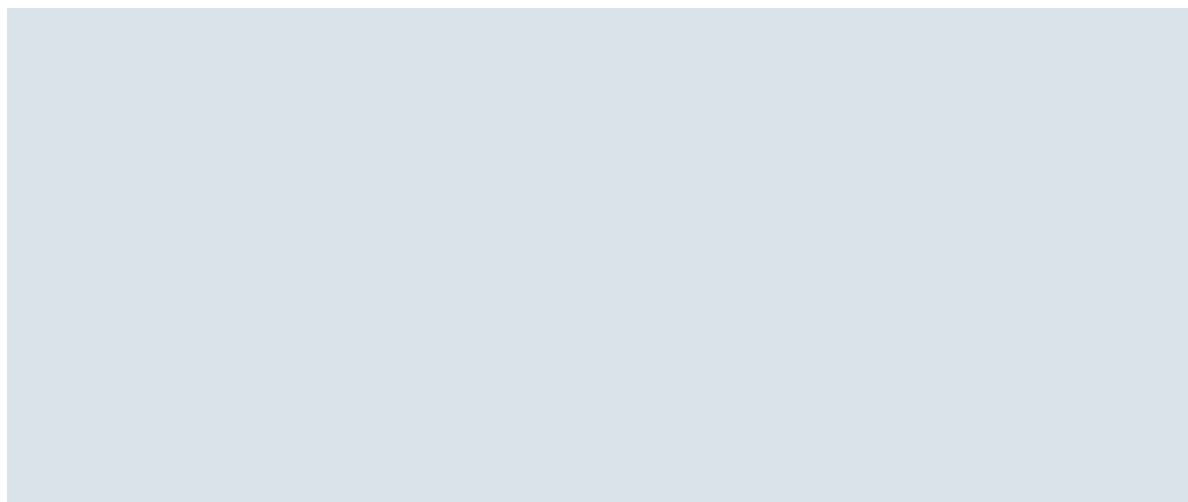
**Accessibility.** Disabled citizens should profit as much from a transport system as their able-bodied contemporaries. However, it proved difficult to measure disable access as we rarely found consistent data across

cities. To make matters easier we decided to take the number of stations directly reachable by elevator as a measure of all-over accessibility.

**Other Amendments.** One reason for revising the CMI was the wish to make it more accurate. We therefore didn't just add new indicators, but also adjusted the measurements for many old indicators to make the results more telling. Take infrastructure provision: Measuring road km/1000 population was substituted for road km-lane/1000 population. This means that a 1 km stretch of single-lane road is no longer seen as equivalent to a 1 km stretch of three-lane road.

We also adjusted the measure of accidents from fatalities/population to fatalities/vehicle drivers.

A specialist data collection agency supplied the data for all 15 indicators across 46 global cities, courtesy of Siemens.



Indicator No.	Name	Definition/ Description	Measure	New or Original?
1	Public transport level of service	Level of organisational, regulatory and modal integration which enhances user experience, service efficiency and urban management	Qualitative	Original
2	Transport management, control & security	Uptake of urban traffic control and security systems and their application which provide infrastructure for proactive management of mobility	Qualitative	Original
3	Transport information and payment systems	Implementation of customer facing tools for journey planning and payment to support both trip decision making and city objectives	Qualitative	Original
4	Air transport	Level of connectivity of national and international air travel and integration of airport facilities with urban infrastructure	Qualitative	Original
5	Sea transport	Level of connectivity of national and international sea travel and integration of port facilities with urban infrastructure	Qualitative	Original
6	Road infrastructure	Optimised provision of road space per 1000 population	Road km lane/1000pop	Original (slightly adapted)
7	Accidents	Rate of fatal accidents from transport	Fatalities/vehicle population	Original (slightly adapted)
8	Pollution	Level of emissions arising as a consequence of transport	Emissions tonne/ha pa (NO <sub>x</sub> , CO <sub>2</sub> , particles)	Original
9	Energy use intensity	Level of energy use intensity from transport	KJ/\$GDP	Original
10	Cost of transport provision/unit GDP	Cost of transport provision for the community	Cost/GDP, (split for road and rail network)	Original
11	Performance of road network	Average journey time on road network	% change of average journey time on road (during peak hours)	New
12	Reliability of Rail services	Reliability of rail journey time	Reliability of rail journey time – percentage of services “on time”	New
13	Affordability	Average cost of travel as a percentage of household income	Average cost of public transport travel as percentage of household income	New
14	Dedicated Cycle lanes	Level of provision of dedicated cycle lanes	Dedicated Cycle km-lane/1000 pop	New
15	Accessibility	Percentage of stations with disabled access	Percentage of stations with lift	New

Table 1	Indicators
---------	------------





## 4.2

### Determining the Score

Each city was scored against each indicator on a scale of 1 to 6, with 6 being the best achievable score, representing “Complete Mobility” as outlined earlier. A city which does well will achieve a high average score on the composite Index, whereas those who are still struggling will achieve only a lower score.

To help you understand how we arrived at a particular score, we have outlined examples of qualitative as well as quantitative scoring below.

#### Qualitative Scoring Examples

##### Transport Information and Payment System

**1** Represents very limited published information which is provided at the point of use only. There will be limited advanced ticketing options for longer journeys and payment is mainly cash while boarding, usually on the vehicle.

**2** Represents published timetables but only for core services which remain mostly on an “on demand” basis. Payment is mainly in cash and while boarding. There are formal tickets or tokens for main services which are sometimes obtainable from shops and agents near stops.

**3** Represents readily available public timetables, including – but not always – online information. Normal tickets are per journey only, but day or season tickets will be available for individual services or operators. Advance buying from stations or agents is possible for longer journeys or season tickets. Cash and card payments are accepted

**4** Represents widespread and also interactive access to timetables and route information. However, this information may often be limited to individual operators or modes of transport. Usually there is some real-time information available, albeit focused on individual components of a journey, such as waiting times for buses or availability of parking. Payment becomes easier: cash and cards are joined by online or mobile payment possibilities, which will again sometimes be limited to individual elements of a journey.

**5** Represents easy journey planning with the help of operator and mode-neutral information readily available online and at public nodes. Transport users enjoy real-time information supplied by urban traffic control monitoring. Here, all modes of transport are covered by internet, mobile and smart card ticketing options. However, payment systems may not be integrated across all modes.

**6** Our highest score represents comprehensive journey planning information that responds to real-time system performance data. All transport options are covered by this service. Cost information includes a user’s environmental footprint for a given journey and payment for the entire journey can be made using a wide range of choices. Last but not least, there are payment systems that allow for incentives, maximizing efficiency and overall social benefit.

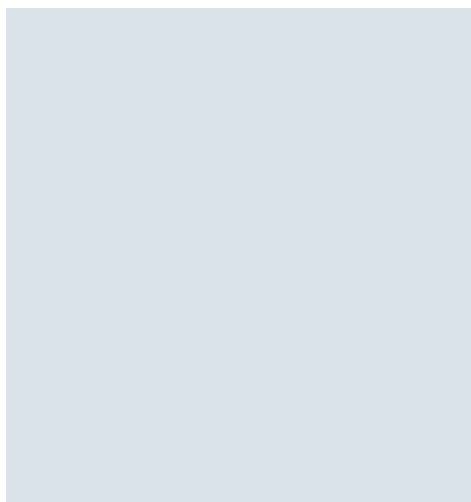
**Here, Vienna scored a 5.**

##### Air Transport

When it comes to assessing the air traffic facilities score of a city, we included indicators such as airport access, terminal facilities, airside facilities and destinations served. We always looked at passenger as well as freight services.

**1** Represents the lack of dedicated surface access resulting in potentially very long journey times. The limited international destinations served are only one aspect of a reduced service which offers only minimum user and airside facilities.

**2** Represents a surface journey to the airport which is blighted by congestion and/or long and unreliable journey times. Travelers can expect only limited facilities and



choose from mainly same-continent international destination and only a few global city destinations.

**3** Represents dedicated surface access with reasonably predictable journey times. Adequate terminal facilities are constantly in danger of being overcrowded. Airside facilities are also no more than adequate. Flyers can choose from a modest range of international and national destinations served.

**4** Represents access to the central business district by dedicated, rapid and congestion-free public transport. The terminals offer high quality but are potentially overcrowded and sometimes complex, making transfers lengthy and cumbersome. At peak times the airport is often subject to airside / ATC delays. A good choice of international and national destinations is served.

**5** Represents dedicated public transport access which benefits from integration with local systems, including information, ticketing, network management etc. The high-quality terminals boast modern facilities with transfer and surface access easily managed. The largest airplanes can be handled by the good airside facilities and there is a choice of a large number of international and national destinations.

**6** The highest score is awarded to airports which in addition to their high quality overall facilities also manage to fully integrate

the national air travel offered with other national transport modes. This ensures optimum travel choice in terms of wider economic, environmental and social aspects.

**Here, Vienna scored a 4.**

## Quantitative Scoring Examples

### Accident Fatalities

Fatalities/1000 vehicle population	Description	Score
> 0.3	Extreme rate	1
(0.3 – 0.1)	Very high rate	2
(0.1 – 0.06)	High rate	3
(0.06 – 0.04)	Medium rate	4
(0.04 – 0.025)	Low rate	5
< 0.025	Very low rate	6

**Here, Vienna scored a 5.**

### Road Infrastructure

Road km-lane per 1000 population	Description	Score
(0 – 0.25)	Minimal infrastructure	1
(0.25 – 0.5)	Very low provision	2
(0.5 – 0.75) and (> 3)	Low provision and excessive provision	3
(0.75 – 1) and (2 – 3)	Medium provision and very high provision	4
(1 – 1.5) and (1.75 – 2)	Good provision & high provision	5
(1.5 – 1.75)	Optimal provision	6

**Here, Vienna scored a 6.**

Later in this report (Section 6) we will discuss Vienna's performance. All scores of the city can be seen in detail in Table 2 of that section.



## 4.3

### The Complete Mobility Index

The updated Index (see Figure 6) shows Zurich still triumphantly at the top. Amsterdam, however, has been pushed back into 4<sup>th</sup> place by Munich, which is now

the runner-up. Vienna, the city we're focusing on in this study, has retained its earlier ranking and has come in third. Figure 7 shows the mobility score ranking.

When comparing the original Index to this revised chart, it becomes clear that the positive correlation between per capita GDP and mobility score gained has retained its validity.

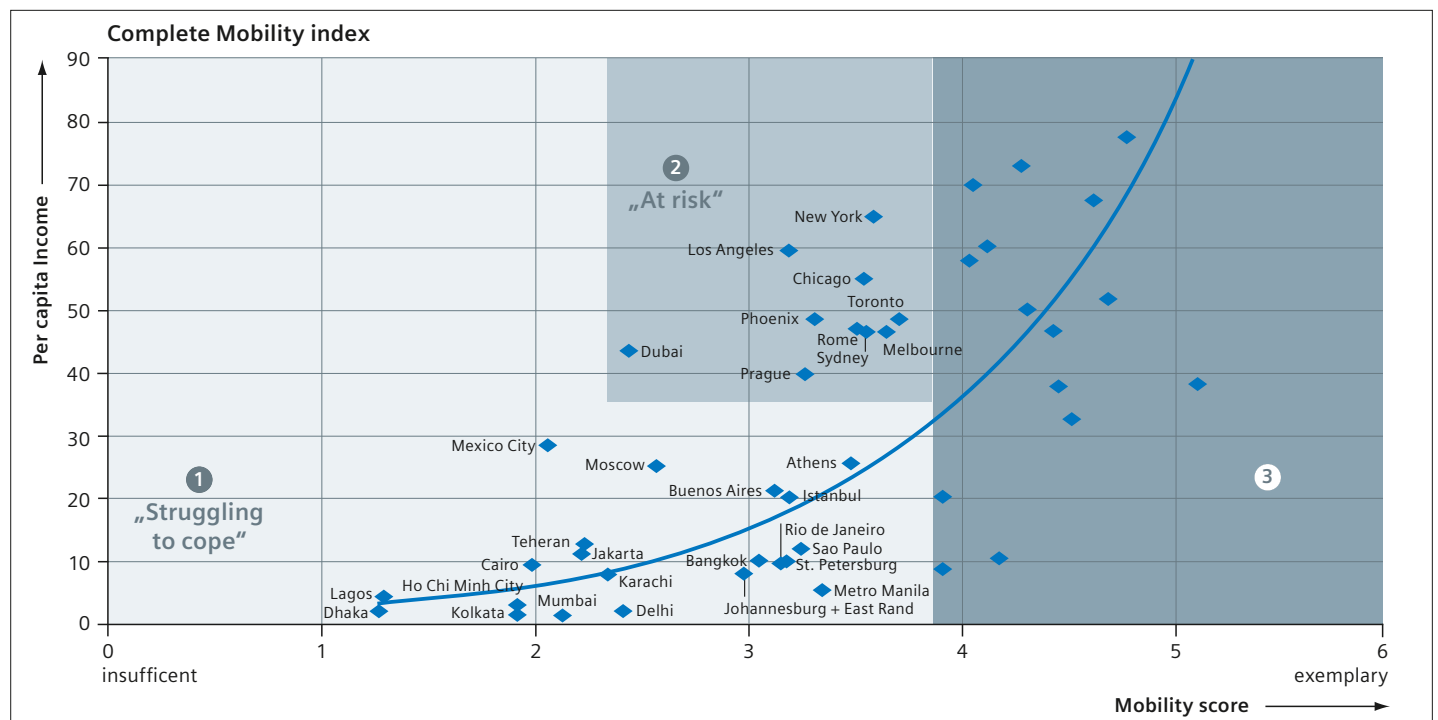
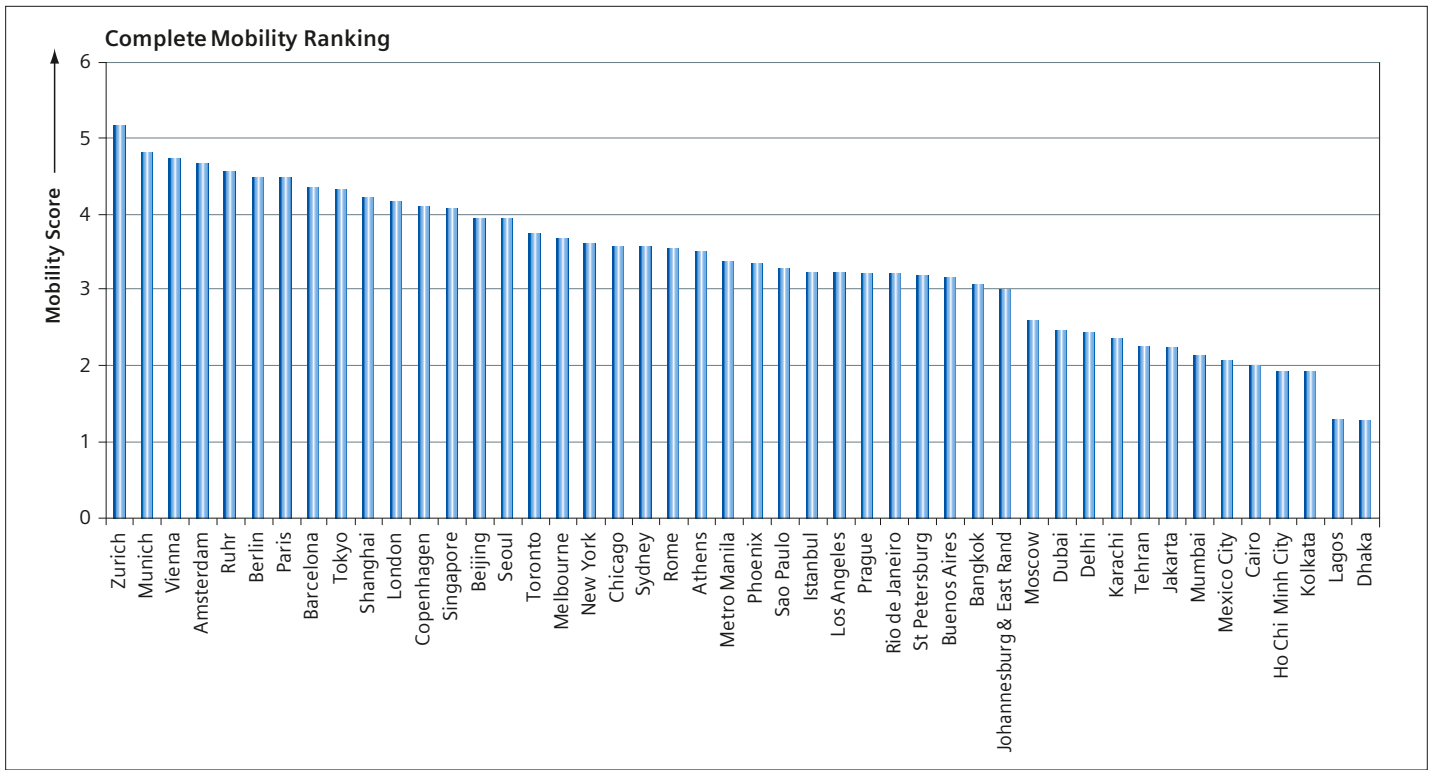
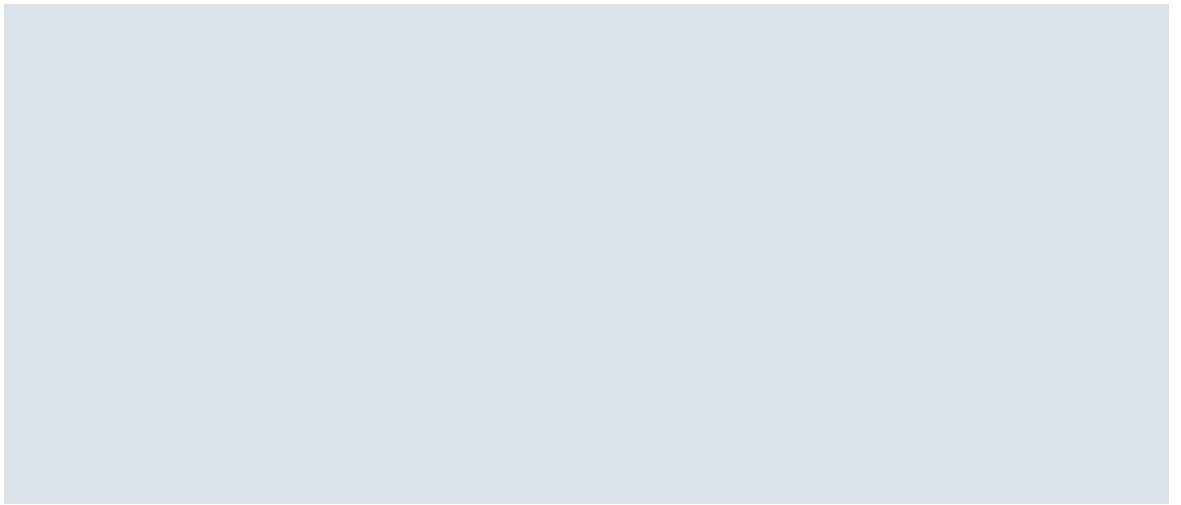


Figure 6

Updated 2009 Mobility Index





**Figure 7**

Ranking of Cities by Updated Mobility Score

However, individual cities have moved both vertically and horizontally. Vertical movements can have two potential

explanations: A real change in per capita GDP or an improvement in data accuracy.

Take Dubai: Originally positioned closely to the trend line within Group I with a recorded GDP of \$19,473 in 2005, it finds

## 4.0 Bringing the Complete Mobility Index Up to Date

### 4.3 The Complete Mobility Index



itself positioned significantly higher on our new Index. The 1995 GDP figure, which was supplied by the mayor's database, was probably incorrect, underestimating the true figure for that year. Also, Dubai has been experiencing an unprecedented boom and a rise in per capita GDP. These factors explain Dubai's movement.

Note that Dubai is still not at a better position in our Index, as the mobility score has not risen in parallel with the rise in GDP. Dubai, thus, moved away from the trend line but has not moved further ahead in the Index.

Other cities' vertical shift might also be attributable to improved data accuracy. Some cities have even moved vertically downwards. In most cases this is extremely unlikely to have been caused by a real fall in GDP. Again, it's likely to be improved data accuracy. Note that Vienna is also in the latter category; we believe that the new, lower, figure is a much more realistic representation than the original figure.

Similarly, any horizontal movement is likely to be caused by two factors. Mainly,

it can be attributed changes in indicators and scoring, but data accuracy will sometimes be the real reason here too. We have used 15 indicators (instead of 11 as in the old Index) which in itself can be a cause for some of the drop in mobility scores across the board.

The nature of the Index demands that a score of 6 is difficult to reach and only a few such scores will ever be awarded. That's one reason for the average score of a greater number of indicators to fall. Also, there's the possibility that a city scores very well (or very poorly) on one of the new indicators, impacting on its final score.

The data improvement which is likely to be at the source of much horizontal and vertical movement is mainly due to improvements in the consistency of city-area definitions used. An added bonus was the data collection agency's ability to collect data from a range of strong sources.

What's noticeable is that most cities remained in their original groups or have

been replaced by similar cities. The predominance of North American and Australian cities in Group II can be attributed to the usually ineffective and wasteful traffic management prevalent: An overprovision of roads, malfunctioning or even rudimentary public transport and an enormous waste of energy and efficiency are apparent at every turn.

Of course there will always be cities which fall within the margin of two groups. It is important to remember, though, that the CMI's segmentation has been built on professional knowledge and understanding, using macro-level clustering to create broad groupings.



#### 4.4

### Applying the Results – The Story of Vienna

We will now move on to investigate the story of Vienna: We want to understand the city's development to the present and its potential for the future using the CMI and general city data. The latter, which supplements our CMI research, has been gained from further in-depth research in the city and numerous interviews with the movers and shakers who hold the key to understanding how Vienna works.

On the whole we found a picture of a highly integrated city: A city with integrated politics, integrated ownership of key functions and the will to integrate local European knowledge with global best practice.

We believe Vienna's success is mainly attributable to consistent, harmonious and fully integrated policies and projects – its high profile and globally recognized best practices (such as the world's lowest floor tram) are the but the icing on the cake.

The city mirrors its own musical heritage: Music lovers and experts alike have been rating the Vienna Philharmonics amongst the top global orchestras ever since their inception probably owing to the persistent high standards achieved by not grooming one or two star performers, but by aiming for an even distribution of brilliant talent. It is this same approach which places "Vienna's mobility orchestra" among the best in the world.



# 5.0

In this section we will explore the historic roots of Vienna's success in the CMI.

## Vienna: The Foundations of Complete Mobility



### 5.1

#### Complete Mobility – The Foundations of Success

The CMI maps out a pathway from a low mobility rating towards “best in class”. Section 3.1 described a typology of cities within this pathway as illustrated in Figure 5.

City administrators studying the Index will obviously reflect on their city's position within it and hopefully be inspired to think about which steps they should take to improve their position. Cities such as Vienna which come in at the top are well advised to keep thinking about the future, but it also pays for them to look at how they got to their current position and at the historic roots of their success.

Remember that the Index groups cities in three clusters. “Struggling to Cope”, “At Risk”, and “Best in Class” cities (see Section 3.1). The CMI suggests critical interventions and infrastructure amendments which will help cities move upwards through the Index. Section 7 will present specific examples applied in Vienna. Now, however, before examining this city's historic roots for success (Section 5.2), we will review the main levers for upwards movement through the Index.

Some levers are most pertinent to the lowest level cities as they aim to plug infrastructure gaps and create links between modes. For example:

- Additional urban infrastructure development – especially public transport

- Traffic control and enforcement
- Better logistics management
- Improved links to ports and airports
- Better connections to key (inter) national destinations
- Affordable transport for all.

Some higher levers are aimed at helping the middle ranking cities to move towards best in class. These focus on integrated policy and management, as well as developing flexible, demand responsive, and user friendly services. For example:

- Policy measures including denser urban area
- Better traffic control and enforcement
- Public transport provision combined with mode transfer opportunities



## 5.2

### Vienna – The Foundations of Success

- Demand responsive transport
- Improved transport efficiency – including pricing measures and information to consumers
- Energy efficient, pollution reducing technology

Vienna stakeholders see a number of measures as having been instrumental in laying the foundations for their city's success in the Index. We review these measures below as they are clearly linked to the CM levers for change.

Figure 8 presents a non-exhaustive list of key factors and events highlighted by Vienna's stakeholders as the foundations for success. These factors are placed within a planning and policy context that stakeholders note is of overriding importance: A stable political vision for mobility and an integrated planning approach. These both reinforce the levers for success described above.

#### A Stable Political Vision

In many cities, political leadership has changed many times, with the issue of mobility being used as a pawn to gain votes. Vienna, however, has always enjoyed political consensus on the importance of a balanced and integrated user-friendly city and mobility system. The years between 1983 and 1994 saw the in-

troduction of a cycle lane network and the night-time ban of heavy trucks over 3.5 tons. Luckily, the political leadership during the '60s and '70s resisted the then perceived wisdom of making use of private cars the benchmark for city transport. Instead, a political decision was taken to retain the tram network and plan for the expansion of the Metro system.

The role of strong and popular political leadership seems to be the "hidden hand" in the development of successful mobility cities. From Lerner in Curitiba to Livingstone in London, these kinds of leaders can both make the case for innovative policies and have the courage to see their implementation through to a successful conclusion.

## 5.0 Vienna: The Foundations of Complete Mobility

### 5.2 Vienna – The Foundations of Success



In the '60s and '70s individual needs were often relegated to second place behind the needs of current and predicted car use. Many western cities saw themselves drowning in concrete jungles of urban motorways and large car parks. Vienna, however, resisted. A key turning point seems to have been the collapse of the Reichsbrücke bridge, which crossed the Danube in the center of the city. The new bridge

was ultimately not well connected to the existing road networks and all advances to introduce an urban motorway were shunned.

The scope for future development is often set by an incidental alliance between predictable or planned change and unforeseen events such as the collapse of a bridge. Currently there is pressure in

Vienna to complete the motorway ring in the northeast of the city. The decision on this matter will be watched with interest.

In June 2009, Vienna hosted the high-profile UITP World Congress. Major players in public transport from all over the globe (operators, suppliers, and policy makers) attended, making the city centerstage at an event which provides a showcase for all that Vienna has achieved. The 2008 Sustainability Report of Vienna was published at the same time to highlight the strong environmental performance of the city in mobility matters and beyond. These high-profile activities bear witness to the supportive and consistent political and policy approach followed by city leaders.

#### Integrated Planning

Once the basic infrastructure to meet mobility demands is in place, a city must strive for integrated planning as it is a key factor to achieve CM. This includes the provision of opportunities for modal transfer as well as the active use of information and pricing mechanisms to provide seamless travel.

Early on, Vienna set in place an integrated transport master planning process which covered all modes, parking policy, pedestrians and cycling as well as safety. The In-

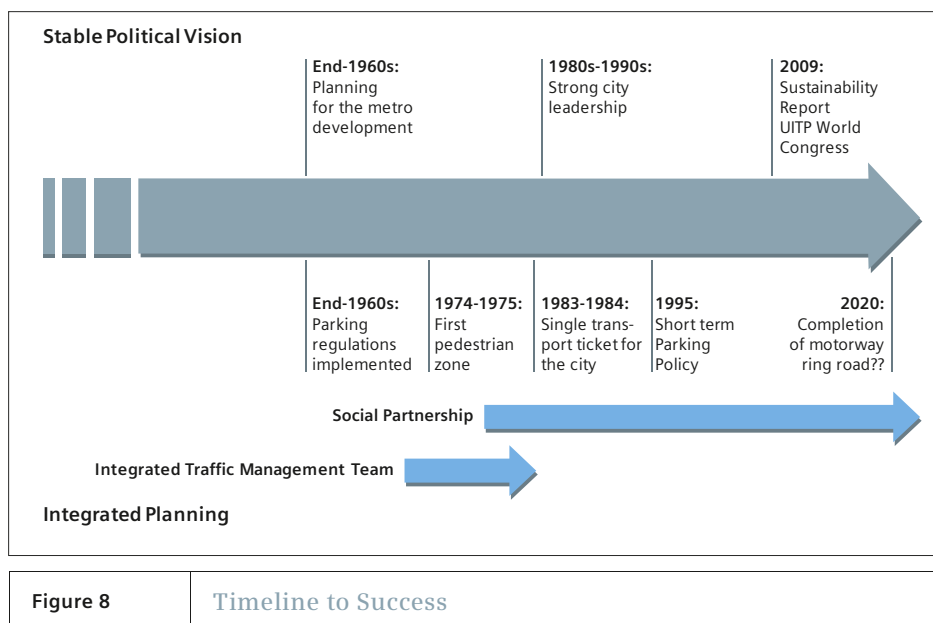


Figure 8

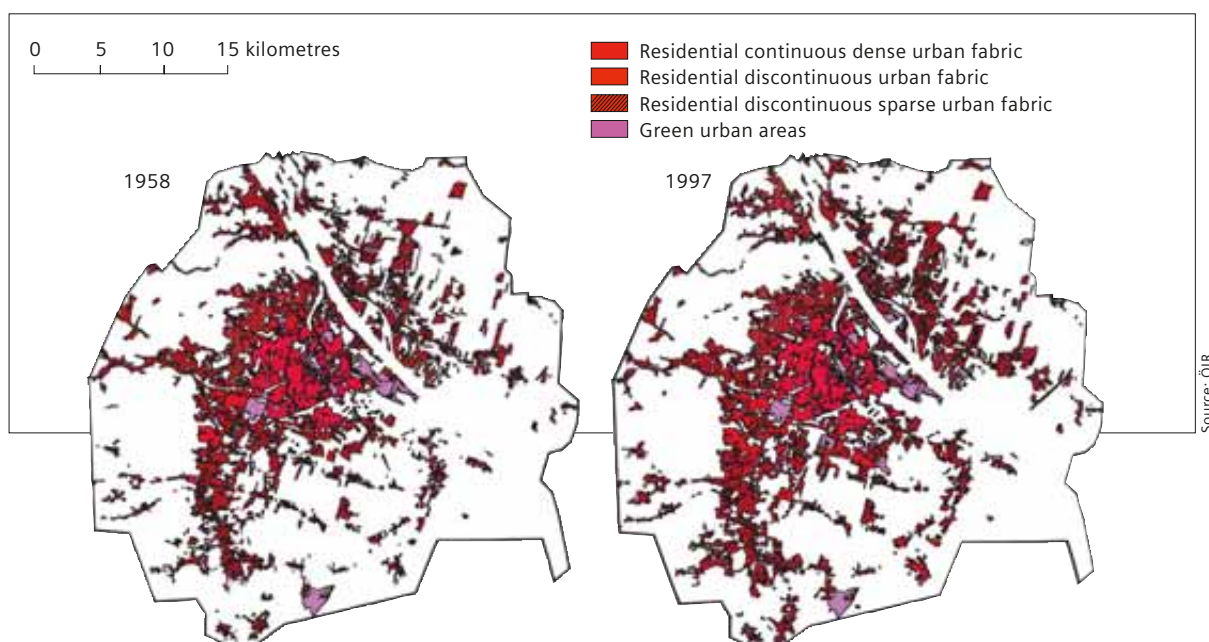
Timeline to Success





Figure 9

Urban Growth in Vienna between 1958 and 1997



egrated Traffic Management Team was at the core of this process. It included independent experts, academics and officers. The team was charged with a number of key policy evaluation studies (e.g. study the impact of long-term parking provisions in the city and impact assessment of the night time truck ban) which helped the city determine an integrated and holistic plan for the urban area.

Interestingly, an early development and application of a transport planning model for Vienna, created in the car-loving 70s, explicitly included pedestrian movement, which was very unusual for the era. This precursor to the VISSIM model was used to support planning decisions such as the rejection of large-scale development at the central Heldenplatz in 1974 and keeping tram lines open.

By definition, integrated planning requires consensus and thus mechanisms for consensus building. Apart from the Integrated Traffic Management Team, which was an early representation of this, Vienna relies heavily on the Social Partnership. The Social Partnership is a voluntary co-operation between employers, employees and

the city. The Chamber of Commerce is a key player which has given active support to the promotion of public transport access and the utilization of parking policies to restrain car use. The Partnership remains a powerful agent for managing change and has a central role in evaluating and promoting consensual change.

Another reason for the city's success is its willingness to learn from other European cities. The pedestrianisation of Rotterdam informed the pedestrianisation of Vienna, as did studies of Salzburg and Innsbruck. Zurich has served as an inspiration for public transport policies.

Universities are always good innovation drivers. The Walking and Cycling Club of Austria (Verkehrs Club Österreich) which is based at the University of Vienna, lobbied for a well-developed cycle network and supported its development from the outset. A close and supportive relationship between academics and policy makers often has powerful results for innovation.

The lever which really puts the finishing touches on CM is improvements in transport efficiency and user focus through the use of pricing measures and information to consumers. In 1980, Vienna introduced

an integrated ticket which is a prime example of the simplification of mobility systems and an essential tool in opening up access for the traveler. Most crucially, this one point of payment access to the system allows travelers to clearly recognize the value of the (joint up) system. This recognition is the only way to initiate a positive spiral of increased transport use – increased revenue – increased investment. In addition, the Viennese are also able to pay for their parking using public transport ticketing machines.

Parking itself remains a key demand management policy area. The concept of CM recognizes the need for the use of this policy tool to manage care-based demand while ensuring economic vitality. To ensure a fast turnover and to extract optimal economic value of central area parking, a maximum stay of two hours was introduced for parking spaces in 1995.

Finally, the increase of urban density is another key lever for CM. Vienna has been successful in using this lever (see Figure 9). The new developments to the north of the city – Seestadt/Aspern and Siemens City – are no exception to this policy aim.

6.0

# Vienna: Complete Mobility Performance



6.1

## Vienna's Performance Close Up

Table 2 shows Vienna's performance in the Index split into its separate indicators.

All indicators can be categorized into each of the three main CM components: user-focus, efficiency and sustainability. Although many indicators contribute to more than one category, we considered only those most relevant for a comparison between Vienna and five other European cities: Munich, Berlin, Amsterdam, Zurich and Prague. In the following section, three different diagrams will peg Vienna's performance against that of the other cities. We used the scores from the updated CMI.

In three instances, no usable data was available. To complete the diagrams, we used the relevant city's average score across all other indicators to fill the gap.

On all three diagrams, Vienna is represented by the thick blue line.

### User-Focus

Essentially, the user-focus category includes five fundamental indicators across all of which Vienna scores well, achieving mostly 5s and 6s.

Accessibility and barrier-free movement is a particular strength of the Vienna transport system, making its high score for this indicator unsurprising. The city's weakest score comes in the "average household expenditure on public transport travel" indicator which, according to Statistik Austria, lies at 13.10% for Viennese households in 2005. The relatively high percentage compared to other cities means public transport is less affordable, giving Vienna a low

score. Prague, for example, also scores a 3 for this indicator, but the percentage of household expenditure for public transport lies at only 11 %.

However, the high costs associated with public transport in Vienna do not seem to dissuade the public from making good use of the facilities. The quality of the transport system is such that people are willing to pay the amounts required, a fact which indeed highlights the strong value proposition of Vienna's public transport system.

Across these five indicators, Zurich performs particularly well, matching or outdoing Vienna at each of them. Its extensive and well integrated system and the growing patronage of public transport persuaded our experts that Zurich enjoys a



City/Urban area	Country	Population	GDP/head
Vienna	Austria	2.31	51.60

Qualitative Indicators				
Local public transport services	Transport management/control	Transport information and payment systems	Airports inc surface access	Port facilities
5	5	5	4	5

Quantitative Indicators									
Road infrastructure	Traffic fatalities	Energy Use Intensity	Polluting emission	Cost of transport provision/unit GDP	Quality of road network	Average household expenditure on public transport travel	Quality of Rail services	Dedicated Cycle Lanes	Accessibility-Disable friendly stations
6	5	5	4	3	N/A	3	5	5	6

Final Index Score
4.7

N/A = Data collection service found this figure to be "Not Available"

**Table 2** Vienna's Performance in Updated Index



6.0 Vienna: Complete Mobility Performance

6.1 Vienna's Performance Close Up

user-focused, accessible and easy-to-use transport system.

Out of the six cities chosen, Prague performs lowest. However, this does not mean that Prague has an insufficient transport system: For a fast-growing historic city, it has done well to develop an integrated system, even if it's difficult to keep up with developments.

Efficiency

Six of our indicators pertain directly to the efficiency of a given system.

In this category, Vienna's scores show wider divergence, with scores ranging from 3 to 6. Again, its lowest score comes from a cost-based indicator, "cost of transport provision as a percentage of GDP". To give you an idea of what this means: To score a 6, the value must fall into the range of 0.05-0.075 which represents fairly high (though not the highest) cost of provision as is required for a high-quality but balanced system. At 0.019 Vienna's cost of provision is lower.

For "road infrastructure", Vienna was able to repeat its 2008 Index success with a score

of 6. As explained earlier, a 6 can only be achieved if there is neither over- nor under-provision of road infrastructure. Vienna's high score thus also confirms the policy of restricting road building.

Berlin's score in this sector follow Vienna's very closely – it scores lowest for the same indicator. It matches most of Vienna's scores except for "quality of road network", where it does particularly well. This indicator denotes improvements in journey times in the city center. Here it should be noted that extreme decreases do not receive a 6, as these are assumed to have

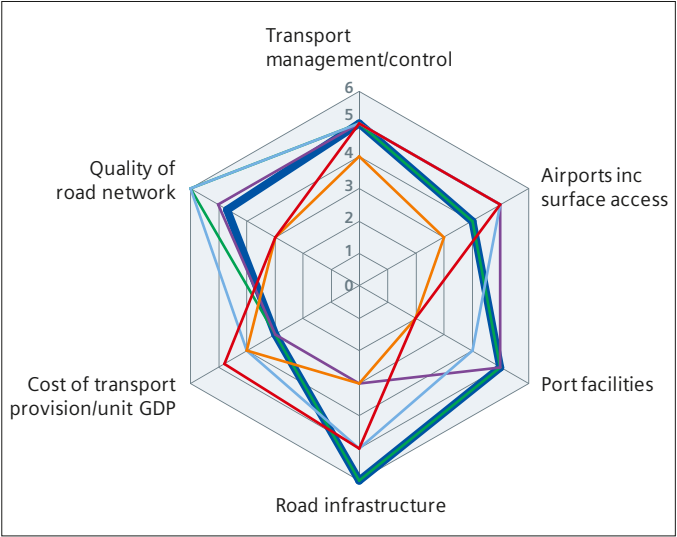
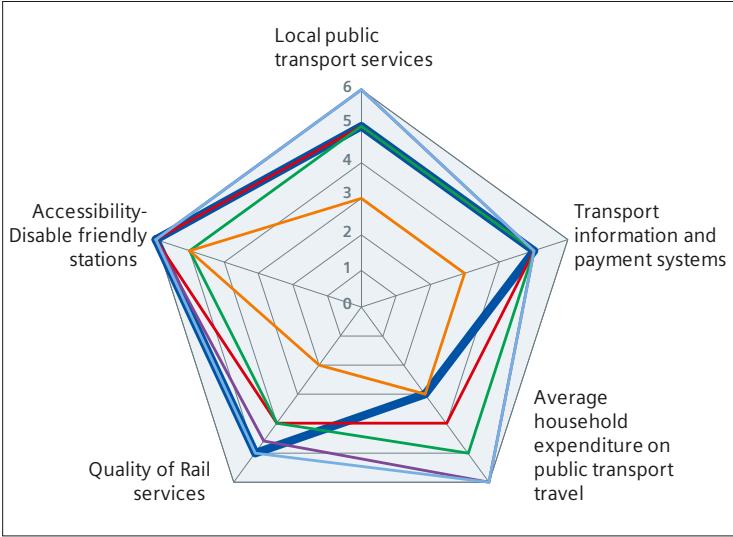


Figure 10 Comparison of User Focus Indicators

Figure 11 Comparison of Efficiency Indicators



arisen due to large infrastructure implementation as opposed to management based techniques. For this indicator, there was no data available for Vienna, so its plotted score is based on an average.

### Sustainability

Transport, of course, is central to any city's sustainability. The Index uses four indicators to reflect different aspect of sustainability.

Vienna has big ambitions for its sustainability profile. In 2007 and 2008, Stadtwerke Wien issued sustainability reports

which demonstrate the range of target areas and objectives currently held in Vienna. Predictably, the city's determination in the area has resulted in high scores on our Index when it comes to sustainability parameters.

Its low level of energy use intensity, few traffic fatalities and good supply of cycle lanes stood it in good stead. Its weakest score, "polluting emissions" still stands at a respectable 4. This indicator includes measurements for carbon monoxide, sulfur dioxide, nitrogen dioxide and PM10.

Munich outdoes all other cities in this area, receiving a full 6 points everywhere except for "dedicated cycle lanes" where it receives a 5. In Munich, transport is high on the political agenda and planning is strong. High-density population, an extensive and integrated public transport system and good policies for making the city pedestrian and cycle friendly have all contributed to its strong performance here.

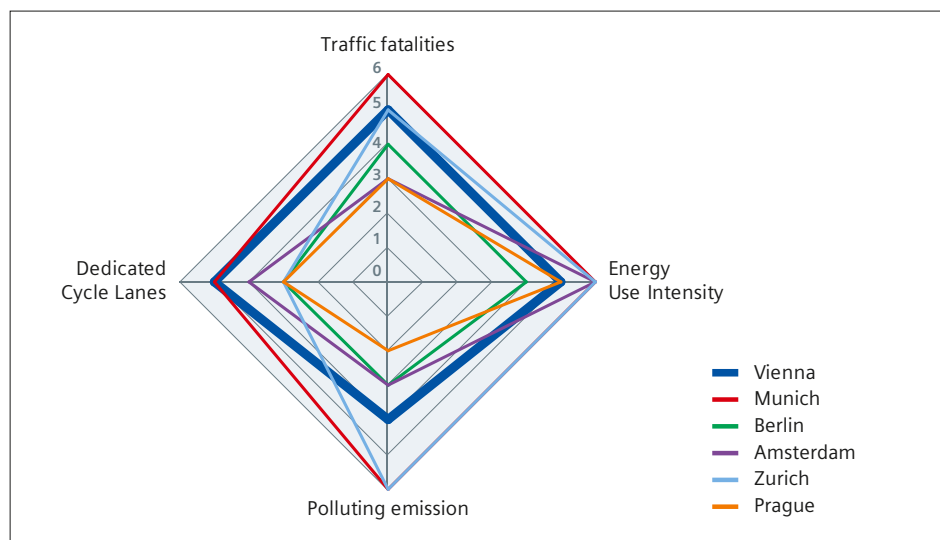


Figure 12

Comparison of Sustainability Indicators

7.0

# Vienna: Complete Mobility Experience



The emerging picture of Vienna is of a city whose mobility strength draws on its consistent, harmonious and fully integrated policies and projects: The integration and breadth of policies trumps any approach relying on specific high-profile infrastructure implementation. The following section will provide some detail about the

Vienna experience as it stands today. First we will describe a number of separate yet connected examples of CM as found in Vienna. This is followed by an integrative view of the city from a traveler's perspective.



7.1

Current Complete Mobility Examples

To reflect Vienna’s advanced level of integrated planning and breadth of policies, this section presents five particular examples of how Vienna has built on its “foundations for success” to achieve its current CM position. Our five examples cover three broad themes and two recent implementations which have become apparent during our study of Vienna’s CM status.

The examples have been chosen as they all pertain to a fundamental aspect of the CMI: They provide lessons to other cities. Each example is described and illustrated and presented in a CM context. They are summarized in Table 3 below and subsequently reviewed in greater detail.

Complete Mobility Example	Complete Mobility Concept			
	User Centred	Efficiency	Sustainability	Proactive Management
Integrated Planning and Ownership		✓	✓	
User Engagement	✓			
Public Space	✓	✓	✓	
Twin City Liner	✓	✓	✓	
ITS Vienna region	✓	✓	✓	✓

Table 3

Complete Mobility Examples



## 7.0 Vienna: Complete Mobility Experience

### 7.1 Current Complete Mobility Examples

Title	INTEGRATED PLANNING AND OWNERSHIP
Complete Mobility Concept:	Efficiency; Sustainability
Complete Mobility Impact:	Land use and transport co-ordination; proactive management

## Description

For both the Vienna Transport Master Plan (MPV03) and the Urban Development Plan (STEP05), the concept of intelligent or smart mobility (see Section 8.1) provides a holistic guiding framework. Take Siemens City (Siemens-Allissen) as an example. Part of the “13 Key Areas of Action” within STEP05, it involves the development of a new campus for 6000 Siemens employees.

Ensuring good public transport access is one of the priorities aimed at ensuring both the sustainability and efficiency of the new site. At the moment, regional planning is not quite sufficient given the wide catchment area of the city. However, the next Regional Transport Plan on a Länder level, due in 2012, will be integrated with the city, increasing the population covered from 1.6 million to 2.5 million.

A lot of local knowledge finds its way into mobility planning in Vienna, with academic and research organizations as well as governmental bodies providing input. Wiener Stadtwerke's second sustainability report 2008 reflects this high-quality input.

Political myopia does not seem to blight policy making in Vienna, regardless of the active pursuit of some targets. Wiener Linien, the public transport company, has a clear target to achieve a 40 % modal split towards public transport. This split is well supported by the sustainability report which sees mobility as “a cornerstone of sustainable development”. Wiener Linien is well on its way to meet this target: Currently, the split stands at 35 % public transport use and the company's €1.8 billion planned investment by

2013 should bring the target into even closer range. Interestingly, there is no competitive tendering in Vienna: It is seen as a one-way road to a narrow focus on operational data, which policy-makers in Vienna wish to avoid.

Wiener Linien is owned by the city, resulting in enhanced communications and coordinated activities. A recent operational study comparing interaction levels between transport companies and city administrators found Vienna to have a ten times higher interaction level than some German cities. Even small-scale feedback can have an immediate impact. Drivers, for example, are encouraged to comment on small changes which they feel are necessary, such as increased turning circles at certain points. These suggestions are easily communicated and delivered. Common ownership has resulted in common service delivery; a single training department for all drivers, for example, ensures the same customer service culture in all modes of public transport.

Industrial relations in Austria are very much defined by the system of social partnership. Vienna's transport industry uses this fact to its advantage. Social partnership rests on voluntary co-operation between employers, employees and the state, ensuring policy decision making which is directed towards consensual solutions between these partners. Benefiting from this tradition is the transport system, which is developed along strongly consensual policy lines.



Title	USER ENGAGEMENT
Complete Mobility Concept:	User Centred
Complete Mobility Impact:	Market segmentation and establishment of value chain; enhancing lifestyle choices

## Description

For many years now, the city of Vienna has been organizing a resident satisfaction survey which polls around 5500 people every other year. City administrators have thus been able to monitor user perception of, attitudes to and rating of transport provision, the latter of which is traditionally very high. The results of the survey are used to match transport provisions even more closely to what people need and demand.

Sure enough, a 2007 European Commission survey “Perceptions of Quality of Life in 75 European Cities” found a resounding 85% satisfaction rate for public transport in Vienna. Similarly, a 2006 study entitled “Benchmarking in European Service of Public Transport” found a 74% overall satisfaction rate for Vienna public transport. The latter study compared nine European cities and Vienna scored highest in two categories: “Personal Safety and Security” as well as “Loyalty”, with 81% and 75% of respondents giving the most positive reply respectively. In 2008, Vienna’s Sustainability Report noted that “These placings could not be retained in 2008” and officials are eager to understand why.

Additionally, Wiener Linien has always been keen to direct marketing offers to specific segments of their customers, especially the young. There even is a website dedicated to young travelers



Figure 14

Wiener Linien Advertisement targeting Young People

([www.rideontime.at](http://www.rideontime.at)). This practice is a key aspect of achieving high CM rankings as knowledge of user needs and attitudes results in clearly segmented target offers. User-oriented development has led to novel ways of thinking and has been instrumental in making public transport a success in Vienna. This – as stated earlier – also rests on customers recognizing the value they’re getting. Ideally, transport officials should always be fully aware of user concerns, ideas, current and future needs and the factors underpinning all of these issues.

Some argue that the private sector is unsurpassed in catering to individual customer needs. Yet, Wiener Linien, publicly owned, has been exemplary in doing just that, sending a clear message that the private sector holds no monopoly in this area.

One prime example of user-driven development in Vienna is the development of the Astax (Anruf sammeln) system. Citizens living in less densely populated areas and at times of sparse demand can call for a taxi to cover their trip. Wiener Linien farmed this service out to a private operator who will match requests to enable a “many-to-one” routing, recognizing the passengers’ need for a seamless trip. There have been countless other innovations thanks to Wiener Linien’s user focus, such as the bike scheme and the city car share system.

Note that Wiener Linien has achieved extremely good service accessibility for a very high percentage of the population. 98.8% of schools are within 300 meters of a bus or tram stop and within 500 meters of a Metro stop. 96% of residential and office buildings are in the same proximity.

Satisfaction with public transport in vienna

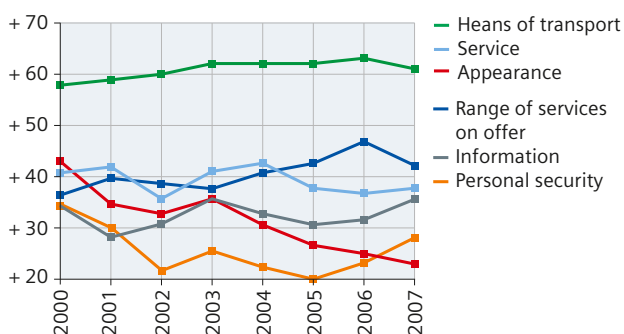


Figure 13

2007 Public Transport Customer Satisfaction

## 7.0 Vienna: Complete Mobility Experience

### 7.1 Current Complete Mobility Examples

Title	<b>PUBLIC SPACE “Strasse Fair Teilen”</b>
Complete Mobility Concept:	User Centred; Efficient; Sustainable
Complete Mobility Impact:	Enhancing lifestyle choices; enhancing environmental quality; enhancing global competitiveness; enhancing quality of life

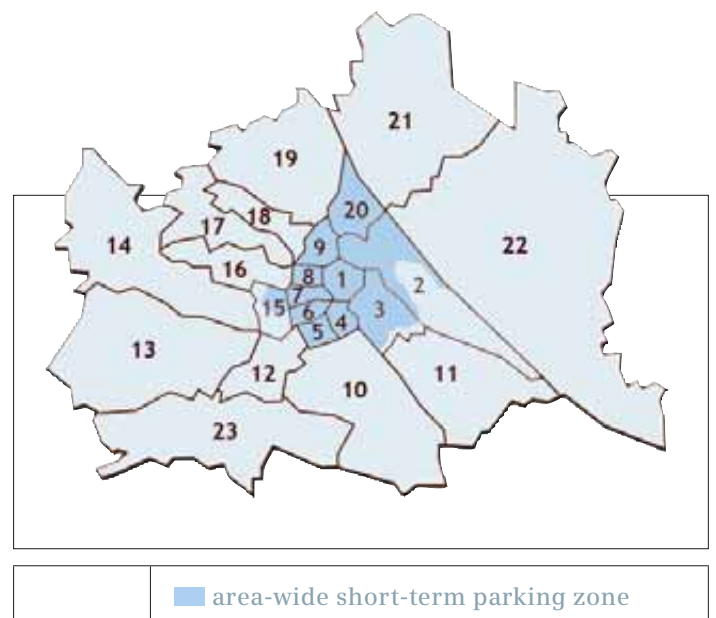
## Description

Originally developed by Dutch traffic expert Hans Mondermann, the concept of “shared space” has been developed further in Vienna. It rests on the idea that all traffic participants can share the same space without having to be consigned to separate areas. Traffic will be slowed down and a generally calmer atmosphere on the streets contributes to safe and pleasurable journeys for everyone, be they pedestrians or van drivers. Needless to say, this is in line with the mode neutrality proposed by the CM concept.

Going for shared space requires new thinking when it comes to infrastructure implementation. Take cycle lanes: Even though the city increased their number to encourage bike use, it is now envisaged that cyclists move towards shared space except in areas where it is deemed too dangerous, for example, outside schools where there are clusters of pedestrians.

Another successful attempt to create shared space is the short-term parking policy applied in some districts of the city (districts 1-9, 20 and parts of 15). Long-term parking has been significantly reduced and there are plans to develop off-street commercial car parks. Both measures reduce the need for on-street parking and have freed up space at ground level. Residents are also delighted that car traffic connected to business or shopping activities has decreased and average parking durations have been slashed.

Last but not least, Vienna also boasts the world’s lowest floor tram, the Ultra Low Floor tram. Developed in partnership with Siemens, this tram is an integrated vehicle that fits in perfectly with the shared space environment.



<b>Title</b>	<b>TWIN CITY LINER: BOAT SHUTTLE VIENNA TO BRATISLAVA</b>
<b>Complete Mobility Concept:</b>	User Centred; Efficient; Sustainable
<b>Complete Mobility Impact:</b>	Enhancing global competitiveness; enhancing environmental quality; multi-segment focus (visitor and worker); valued service.

## Description

Vienna and Bratislava are probably the two European capitals with the least distance between them, both on the same river. Consequently, a boat shuttle between these two was introduced with up to ten departures daily and a journey time of 75 minutes. It is operated by Central Danube Region GmbH, a subsidiary of Wien Holding and Raiffeisenlandesbank NÖ-Wien. Originally run with one boat, the service now runs two boats and is in high demand: Since 2006 it has transported 340,000 passengers, with 150,000 in 2008 alone.

It makes sense to use the river where possible and the shuttle has a low draft and low wash which allow for the often-shallow waters. The boat itself is a light aluminum high-speed catamaran with jet propulsion using two diesel engines and Hamilton water jets. These create a turbo effect and can propel the ship to speeds of up to 69 km/h, but in order to skim along the Danube quietly and economically it usually travels at around 60 km/h.

The boat's popularity can also be attributed to a clear service proposition: In comparison to the train it is expensive; costing

€ 25 to the € 10 spent on a train ticket. However, the boat's pick up and drop off points are right in the city center, with no need to negotiate a central station.

The liner also represents a growing artery to Bratislava and the eastern European countries in general. During the Cold War, Vienna was at the fringes of Europe; now it finds itself as a gateway to a growing eastern market.

Although the Twin Liner represents just one independent infrastructure and operation, we included it in these examples as it provides a relatively expensive alternative to existing modes of transport, but delivers an advantage for which people are clearly prepared to pay. The extension of the original leisure-only use to include business use is witness to this successful proposition.

The Twin Liner exploits an underused resource (the river) in a sustainable manner and the service's only weakness is its lack of integration into the Vienna mobility infrastructure with regard to ticketing and the overall transportation map.



Source: Central Danube Region



## 7.0 Vienna: Complete Mobility Experience

### 7.1 Current Complete Mobility Examples

Title	ITS VIENNA REGION
Complete Mobility Concept:	User centred; Efficient; Sustainable; Proactive Management
Complete Mobility Impact:	Enhancing lifestyle choices; enhancing quality of life

## Description

The acronym ITS stands for Intelligent Transport System, launched by the Vienna city government in May 2009. It is aimed at improving traffic management and at providing travelers within the Vienna region with an accessible tool for trip or route planning. The system has sprung out of a research project and focuses in particular on intermodal trips.

The ITS utilizes a number of data sources. Journey time information is based on data gained from transponders in 2500 Vienna taxis and roughly 300 sensors (such as loops and radar). Additional information is collected from the regional police, the Austrian broadcasting company ORF and from the city itself (such as on building sites) to calculate the best approximation to real journey time. VOR, the public transport association, provides schedule details of all public transport lines and real-time information comes from Wiener Linien and ÖBB (Austrian railways). In addition, all bike lanes and footpaths have been digitized to the fullest degree (even including cemeteries and forests).

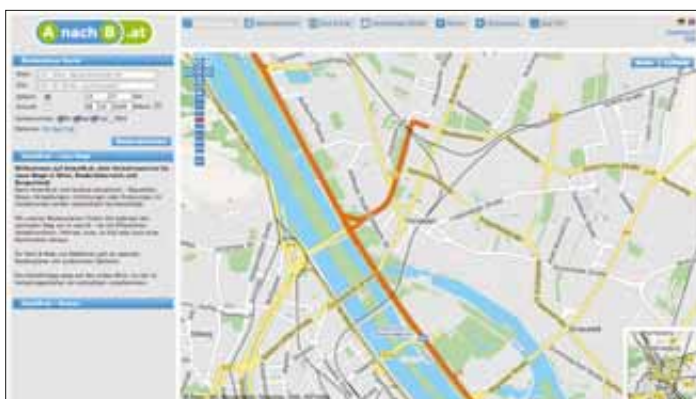
The ITS should make trip planning in the Vienna region much more convenient and the target group will hopefully move further away from car use as the ITS focuses on Park and Ride (see below) and on the combination of cycling and public transport.

In 2009, the developers are also hoping to launch a version of the system which operates on mobile phones to catch people on the go. There are plans to include more information on rural areas, allowing benefits to reach communities there. The system is far from perfect or indeed finished: A number of issues have been identified as warranting further research. These include:

- Weather influences on travel decisions (an inclusion of weather information in the traffic models and travel planner)
- A European platform for intermodal traffic information services
- Influence on up-to-date travel information on travel decisions and ways to improve the positive effects of online travel information
- Estimates of travel times within the rural network
- Operational field tests for traffic telematic systems

Automated tests on the quality of data, services and processes to improve ITS systems.

With its value proposition of making travel easier and more effective, the ITS fulfills one of CM's central postulates of a system having to be "valuable" to the user and being recognized as such.



Source: [www.anachb.at/routenplaner](http://www.anachb.at/routenplaner)





## 7.2 The User Experience

No study of this kind is complete without a “mystery shopper” exercise. Except that in our case we have replaced the mystery shopper with a mystery traveler. We wanted to get a user perspective on Vienna transport and also validate our findings when we sent the travelers out in April 2009.

The research technique known as mystery shopping involves people who visit a shop (or in our case use public transport) and experience the service provided first hand. They record their findings in a semi-structured open and closed questionnaire. Obviously this doesn’t provide large samples of basic data, but it affords a very good insight into the reality of using a service from a customer’s perspective.

In our case, we based the mystery traveler exercise on the experiences of surveyors who used public transport. We recruited mainly eastern European students from Vienna University. Important to the study was the fact that none of the students had lived in the city for longer than three months or spoke German as a first language. They were given a trip with a starting point and destination which they had no prior knowledge of and had never before taken.

We chose our recruits because they represent a growing, and indeed more challenging, target group of Vienna’s transport efforts. Many migrants come from the East and have limited language skills and experience of modern public services. Last but not least, Vienna is home to a large number of students whose needs must be met.

Each participant was asked to travel entirely on public transport (no cars or bikes<sup>28</sup>) and to change mode or service at least once. Before they embarked on their trips, they were briefed on the technique and on the survey form, which was structured into three sections: before, during and after the trip. The form asked students to record how they used and evaluated travel information, the quality and reliability of the transport service and their assessment of current strengths and areas for improvement. After their trips, the travelers were debriefed in a group interview.

#### Pre Trip Experience

All students (apart from one) used trip planning software within Google Maps to prepare for the trip. The remaining student used the Wiener Linien website. All were satisfied with the accessibility and usefulness of the information gained. Note, however, that the Wiener Linien

website user rated the impact of pre-trip information gathering the highest. For his trip to the airport he was alerted to the cheaper S-Bahn service, which he then chose over the dedicated, but more expensive, CAT service.

The use of information technology, it seems, was very much appreciated by our user group. They all printed out all possible trip information, with one person downloading it to his Palm PC. One user also noted that the GPS system within their mobile phone was very useful en route. The only criticism of Google was that bus information was sometimes lacking.

#### En Route Experience

All travelers rated their overall trip experience very highly. Information, punctuality, comfort and interchange were all rated positively and everyone felt they had an essentially easy trip. One traveler, originally from Russia, noted: “For us, its paradise!” Many of his fellow testers agreed, being especially impressed with the punctuality of the service. Even though some had problems understanding the German, most praised the language-based information regarding the next stop. It was suggested that all voice information should be given

<sup>28</sup>This was not part of the recruitment profile

## 7.0 Vienna: Complete Mobility Experience

### 7.2 The User Experience



in German and English, reflecting the international nature of the city.

**Regarding the en-route experience there were two main issues raised:**

**Ticketing:** Ticket vending machines (TVM) within metro and tram didn't convince

**Interchange signing:** Generally good but some room for improvement

**There were three areas of concern with the ticketing system:**

**TVM reliability and impact:** Large queues form as soon as one of the two available machines is out of service. Some travelers, not wishing to miss their connection, were forced to travel without a ticket for part of their journey because of the long lines. The passenger who duly waited his turn at the one machine then missed his train to the airport.

**TVM ease of use for top-up:** When a traveler moves outside the "core zone" of central Vienna, a top-up ticket is needed to cover that leg of the journey. Two of our travelers needed such top-ups for small parts of their journeys. However, as they didn't know where or how to obtain such a ticket, they went on without one, risking being caught without a ticket.

**TVM between modes:** One traveler had to use Wien Mitte station en route to the airport and found that construction made it difficult for him to find the correct TVM. Additionally, he was confused as to which

vending machine to use. Wanting to use Austrian Railway services to the station, he could only find Wiener Linien TVMs, leaving him at a loss.

**Two areas of concern arose with the interchange signage system:**

**Exit signage:** At large interchanges all travelers noted the need for better exit signage during mode change or upon arrival at the destination. Guidance from line to line was judged to be good, but guidance from e.g. metro to tram wasn't. Major interchanges or stations often have many exits and it is difficult to locate the right one. Taking the wrong exit can leave travelers at the wrong side of busy roads or far away from their destination.

**Safety:** All mystery travelers were male and under 24. Despite this, two travelers admitted to having felt uncomfortable during their trips (none of which were on Nite Lines). Other travelers noted they had felt unsafe or threatened at some stage of their journeys, although the overall feeling was one of safety. The problems were confined to lightly used buses and large interchanges which are notorious for attracting more unsavory members of the public.

#### After Trip Experience

Overall, all travelers were happy with their experience. Only one traveler experienced a noticeable delay after he missed his train due to waiting times at the TVM. The over-riding feeling was that the system "just

works"; no negative comments were passed on about overcrowding, comfort, cleanliness or speed. The sparse availability of restrooms was the only point which drew some criticism.

It turns out that a major point was voice information, which is provided only in German. All of our mystery travelers wished English had been available, too, and we know that many Austrian travelers agree. For newcomers to the city, it was noted that some very basic information – again in English – on where and how to board and pay, that is simple usage instructions for the public transport system, would be very much appreciated.

#### Summary

User focus is arguably the most fundamental aspect of the concept of CM: Matching and constantly re-evaluating user needs is a common theme among successful cities. The CM concept highlights the importance of seamless travel and indeed a clear value proposition for users – the value of high-quality mobility must be clearly recognizable.

The strongest message from our mystery traveler experiment is: The Vienna system "just works". However, no system is perfect and there is always room for improvement. Ticketing and interchange modalities will have to be looked at again. That is a certainty, because the findings from this exercise will be incorporated into future discussions on the development of Vienna.

8.0

# Vienna: A Global City of the Future



8.1

## Vision

As highlighted earlier, cities around the world are faced with inescapable trends and challenges. We developed the concept of CM to help cities evolve positively in the area of transport and mobility. Of course, there is no single path to CM and cities currently in the “struggling to cope” group can experience astonishingly fast re-orientation and in principle even bypass interim qualifications in the Index. Here, “leapfrog technologies” have an impact.<sup>29</sup>

Vienna is no exception. Section 2 looked at the applicability of megatrends to Vienna and also at the importance of migration as a specific challenge. In addition, the mystery traveler exercise has illustrated some specific directions for development.

The consensual framework which guides the city’s development, investment and emphasis is the result of years of hard work. As such we wanted to pitch it against the CM concept in order to obtain an idea of the Vienna of the future.

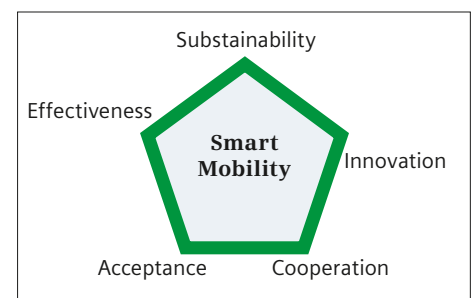


Figure 15

Vienna’s Transport Master Plan:  
Intelligent Mobility

<sup>29</sup> The exploitation of light infrastructures built around ICT are often seen as a key leapfrog technology and indeed are seen to offer great potential in transport management, control, information and payment.





The Viennese call their own transport concept “Smart Mobility”<sup>30</sup>. As illustrated by Figure 15, it draws on five core components: Sustainability, effectiveness, acceptance, cooperation and innovation. Table 4 below highlights the overlaps of Smart Mobility with our own concept of CM which are considerable. We believe this bodes well for the future of Vienna.

Intelligent Mobility	Complete Mobility
<b>Sustainability</b> – in terms of social justice, future-oriented economic systems and sustainable use of the natural environment	Complete Mobility also places sustainability at the centre of any successful mobility system. The desired outcomes include enhanced environmental quality and enhanced quality of life.
<b>Effectiveness</b> – mobility which conserves resources requires a high level of conceptual imagination at the organizational stage	Complete Mobility recognises the importance of proactive management of a transport system in a similar vein to Vienna’s “Effectiveness” component. The core theme of Efficiency in Complete Mobility is a further point of harmony.
<b>Acceptance</b> – trust between all concerned; this means information, communication and motivation as prerequisites for raising awareness	We believe that a Complete Mobility system should be “valued” by all users. For this to be achieved there must be a high level of trust between users and suppliers; users will perceive value in the mobility services and mobility information they use.
<b>Cooperation</b> – partnership with surrounding districts, the regional authority, the ÖBB (Austrian Federal Railways), other bodies beyond the national boundaries and the neighbouring countries, in addition to public-private partnerships	Pro-active management would naturally entail a strong consideration of governance relationships. Partnership to achieve policy consensus is vital to achieving a sustainable system.
<b>Innovation</b> – objectives of sustainability, effectiveness, acceptance and cooperation can only be achieved through innovation in terms of procedures, organisation, implementation, infrastructure and technology.	Although “Innovation” is not specifically mentioned within the definition of Complete Mobility, it does by its very nature underpin the concept as without improvements are limited. By offering best practice examples in this report we can support the sharing of knowledge and encourage innovation in transport.

<sup>30</sup>Though has until recently been termed “intelligent mobility”.

Table 4	Intelligent Mobility and Complete Mobility
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## 8.2

### What Next for Vienna?

This study has focused on Vienna precisely because it scores so well in the CMI. The city's transport system works consistently well with high patronage levels and customer satisfaction. The system's strengths lie in its dedication to integrated planning and ownership, the operation of the Twin City Liner, user engagement throughout the maintenance of Shared Space and the development of "ITS Vienna Region". With these factors in place, the future of Vienna transport sits on a solid foundation.

Even the best system can always be improved and this study has highlighted the areas of development still very much open: The city must address the mobility needs resulting from global and local trends as presented in Section 2. The mystery traveler exercise served particularly well to lay the finger on neuralgic points, which were ticketing and interchange signage. Additionally, analysis of the Vienna's CMI scoring shows that its weakest (though still satisfactory) performance comes in the cost of provision area.

Global practice does provide some insight into approaches to increase efficiency and user focus in these fields. Below, we look at two CM best practice examples before providing some explicit recommendations for Vienna.

#### **Complete Mobility Best Practice: Madrid Intercambiadores**

When it comes to perfecting interchanges, Madrid has gone a long way towards meeting this CM goal. Covering user-focus, efficiency and sustainability, its big "intercambiadores" fulfill all aspects demanded by CM. Like many other cities, Madrid is faced with urban sprawl. High-quality transport corridors have been developed, carrying heavy volumes of passengers and commercial traffic into the city center. To relieve congestion, it was determined that all single-passenger vehicle and bus traffic which wasn't destined directly for the city core should be reduced. Commuting patterns have evolved from a hub-and-spoke, morning-in, evening-out pattern to one of increasing all day, cross network commuting and commercial traffic.



Source: Pindado

Figure 16

Station Atocha, Madrid

To meet the needs resulting from this commuting pattern and to achieve the desired reduction in vehicle traffic, the Madrid authorities designated a series of stations, located at the ends of transportation corridors, as “gateway” facilities, called intercambiadores. The city now has a number of these intermodal interchange stations which were built over several years using a capital program to complement the general expansion of the metro, regional train lines and inter-urban as well as local bus services. Local and regional traffic meet at these interchanges and they are a focal point for development and communities.

Not content with just being effective in a traffic-management sense, the intercambiadores are also designed to be an attractive social and commercial space. For example, Atocha Station, seen in Figure 16, features a concourse with shops, cafés, a nightclub and a 4000-m<sup>2</sup> covered tropical garden. Reminding us of the real purpose of the building, there are the obligatory links to the metro, high-speed rail, regional train lines and intercity and local bus services.

Information flow is critical in such a busy interchange. Atocha and other intercambiadores provide ample information to the traveler, making the facility easily intelligible for the user. At the core lies real-time information, including vehicle positioning information which facilitates accurate and timely information on arrival and departure times and locations. In short, the intercambiadores are truly excellent, efficient and user-focused gateways to the city which encourage sustainable travel within and to or from the city.

#### Complete Mobility Best Practice: Multi-Application Smart Cards

Hong Kong’s “Octopus” card or London’s “Oyster” card are two very well recognized examples of smart cards which serve to ease traffic flow, ticketing and information relay while having many other uses for the metropolitan traveler. We identified smart cards as an important tool for achieving CM, but these cards also support city functions and services in a much wider sense.

Smart cards differ from smart ticketing in that they don’t only support seamless travel, efficiency in operations and user-focused services as demanded by CM, but also give a boost to CM within the city, taking user focus and seamlessness in urban living to a new level. This is achieved by adding a range of local, and even national, services to the various applications of these cards.

In 2000, the English city of Nottingham introduced the “EasyRider” multi-application contactless smart card system. Operated by Nottingham City Transport (NCT), the smart card allows for unlimited travel on



its bus service as well as the tram service operated by Nottingham Express Transit (NET). Customers enjoy considerable flexibility in using the card, as it is adaptable to an individual's needs, allowing for age, usage and even payment method available.

Not resting on its laurels, in 2007, Nottingham City Council introduced an additional smart card, called "CityCard" which aims at integrating multiple applications and uses to a single card. Thus a transit smartcard includes further functions, extending its benefits. The CityCard also allows travel on the bus system – however, as yet has no backing of NET. The CityCard offers many further benefits: discounts at leisure facilities, libraries and retail facilities within the city. Nottingham is also looking into raising people's environmental awareness by attributing CO<sub>2</sub> saving points to users of the CityCard. The CityCard is available to different types of users, keeping the system flexible.

Nottingham has grander plans for its CityCard: It is envisaged to become an essential tool for urban living. It will grant ac-

cess, be a method of payment and provide incentives for living in the City of Nottingham. Initially, the card was rolled out with intensive involvement of the Nottingham Trent University's students. The students, whose campus is in the city center, use the same smart card as their university card, giving them ready access to downloading city applications such as the transport card. Service providers and city planners can easily target cardholding students, making them an integral part of city life. Other UK cities are going down the same route, with Southampton being a particularly strong example.

It is easy to see why a multi-application card is a big step towards CM: It is an ideal tool to deliver incentives and offers aimed at changing user behavior while providing real value. Of course, it is still early for the CityCard and many steps have yet to be taken to make it perfect, but it remains a progressive example of smart card technology used to promote CM to a wide variety of individuals in a given city.



### 9.0

# What does it all mean?



This study started off by outlining the clear pressures that all cities are facing at a time of increasing urbanization and scarce resources. We showed how demographic, personal and lifestyle trends can be expected to impact on metropolitan life everywhere.

City stakeholders consistently describe transport as one of the key issues they face. We wanted to make a city's success in that area measurable and created the concept of Complete Mobility, which is measured by an Index which we first put together in 2008 using relatively old data. Since then, we have gathered new data and our 2009 CM Index is completely up to date.

Vienna is a city which has done well in both years. We therefore took it as an example to show what has been done right, hoping that other cities might take a leaf out of Vienna's book in order to rise in the CM Index over the years to come.

We came to the conclusion that travelers in Vienna experience a mobility system which is truly "best in class": an accessible and efficient public transport system which works well and is generally easy to use, a vibrant city center which is matched to the role of private motor vehicle use in today's society yet reflects the city's responsibility to prioritize and manage demand. Vienna is a city which works.

However, no city is perfect, nor is Vienna. The concept of CM provides a framework for mobility network analysis and its possible development or improvement. Having analyzed Vienna's transport system with the help of our Complete Mobility Index (CMI), we think there is one more valuable step that Vienna should take to give transport facilities the icing on the cake.

#### **Personalized Smart Media**

We strongly believe that Vienna would benefit greatly from an exploitation strategy for personalized smart media which can be used to pay for public transport,

but gives access to other services or special discounts throughout the city. We are not just talking about a transport smart card or other token, but a multi application scheme with mobility at its core.

Modern IT provides possibilities of smart travel and smoothly integrated services that until recently we could only dream about. Personalized smart media can include smart cards, mobile phones, iPhones and other tags or tokens which are tailored to the holder. Their use is manifold: Access, payment, identification or a means to provide targeted offers and behavior-changing incentives. There is also the additional benefit of providing operational data on usage and demand, which is of limited use in public transport.

The younger generation takes it as a given that smart applications will be at hand to plan and manage their everyday life. Note that Google Maps was the tool of choice for our mystery travelers in planning their trips. Apart from this, smart media is very



effective in ensuring low-cost availability of services to the user.

Personalized smart media is ideally suited to achieve the CM vision: Multiple application cards can become essential in joining services for the citizen as well as the service provider (including the public authority). Transport ticketing lies at the center of these cards, but there is a real opportunity to join forces across a city and really increase value while lowering costs.

Under Mayor Ken Livingstone, London Transport first issued the Oyster Card to its users. This card has quickly developed into a smart card which got London well on the way to CM excellence. Two key elements of the Oyster Card are of note:

**Best Value Ticket:** At the end of the day, the traveler will always be charged only with the cheapest ticketing option. If a one-day travel card would have been cheaper than paying for each trip, this is what will be charged. This daily price cap-

ping promise only works as long as the user “touches in” and “touches out” at each trip. Users also don’t have to worry about overshooting their zone and complexity in fare policies become a thing of the past.

**Organizational Change:** Where before there was a service plagued by delays and mismatched connections all round, there now is true customer focus and service. This massive organizational change is attributed by many to the introduction of the Oyster Card, which gave focus to a frayed system of public transport in Europe’s largest city. Vienna’s current system is already well integrated; however, a smart card could facilitate new approaches to management and operations and spawn new service offers.

It is important to note that the introduction of a smart card doesn’t mean a city’s public transport system becomes closed to people who don’t hold such a card. It means, however, that the right incentives (be it cheapest ticketing or carbon offset

points) will entice the regular user to hold a smart card, making the move towards CM excellence easier.

If it ain’t broke, why fix it? It could be argued that, since Vienna’s transport already scores high in customer approval and ratings, it would be a mistake to even investigate the introduction of a smart card. We, however, see it exactly the other way round: The transport system can become the centerpiece from which a multi-application smart card is distributed within Vienna, joining up services for citizens and providing targeted offers and services for the many different groups of people within Vienna and indeed the citizens of the future.

Where Complete Mobility is concerned, Vienna is already best in class. There is, however, always room for improvement. We firmly believe Vienna should take the next step – towards the absolute fulfillment of the highest possible CM requirements. Then it truly will be a shining example for all other cities to follow.

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